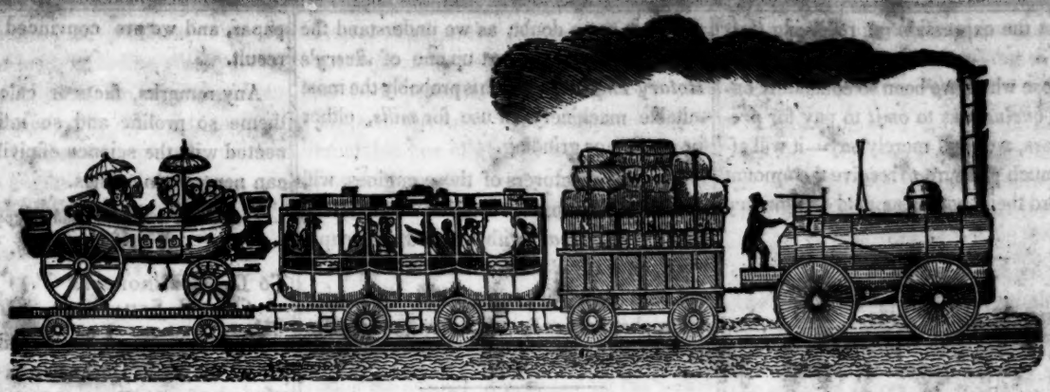

AMERICAN RAILROAD JOURNAL,
AND ADVOCATE OF INTERNAL IMPROVEMENTS.

PUBLISHED WEEKLY, AT NO. 132 NASSAU STREET, NEW-YORK, AT FIVE DOLLARS PER ANNUM, PAYABLE IN ADVANCE

D. K. MINOR, and GEORGE C. SCHAEFFER, } EDITORS AND PROPRIETORS.] SATURDAY, MARCH 11, 1837. [VOLUME VI—No. 10.

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AMERICAN RAILROAD JOURNAL.

NEW-YORK, MARCH 11, 1837.

FOR SALE AT THIS OFFICE,

A Practical Treatise on Locomotive Engines, with Engravings, by the CHEVALIER DE PAMBOUR—150 pages large octavo—done up in paper covers so as to be sent by mail—Price $1 50. Postage for any distance *under* 100 miles, 40 cents, and 60 cents for any distance exceeding 100 miles.

ALSO—*Van de Graaff on Railroad Curves*, done up as above, to be sent by mail—Price $1. Postage, 20 cents, or 30 cents, as above.

ALSO—Introduction to a view of the works of the *Thames Tunnel*—Price *fifty cents.* Postage, as above, 8 cents, or 12 cents.

*** On the receipt of $3, a copy of each of the above works will be formarded by mail to any part of the United States.

10 10t

AVERY'S ROTARY STEAM ENGINES.—AGENCY.—The subscriber offers his services to gentlemen desirous of procuring Steam Engines for driving SAW-MILLS, GRAIN-MILLS, and OTHER MANUFACTORIES of any kind.

Engines only will be furnished, or accompanied with *Boilers* and the necessary *Machinery* for putting them in operation, and an Engineer always sent to put them up.

Information will be given at all times to those who desire it, either by letter or by exhibiting the Engines in operation in this city.

Inquiries by letter should be very explicit and the answers shall be equally so.

D. K. MINOR,
132 Nassau-st., New York.

With unfeigned pleasure we announce the speedy commencement of the Croton Aqueduct, a work interesting to all concerned in Internal Improvement, but of vital importance to the inhabitants of the city of New-York.

The attention of Contractors is invited to the following announcement of the Water Commissioners.

From the nature of the work, and the substantial source from which the funds are drawn, we anticipate a large number of applications on favorable terms.

CROTON AQUEDUCT.

NOTICE.—Sealed Proposals will be received by the Water Commissioners of the city of New-York, until the 22d day of April next, at 3 o'clock, P. M., at their office in the city of New-York, and until the 24th day of April, at 9 o'clock, P. M., at the office of their Engineer in the village of Sing Sing, for constructing a Dam across the Croton River, for the Excavation, Embankment, Back Filling, Foundation and Protection Walls; for an Aqueduct Bridge at Sing Sing, three Tunnels, several large and small culverts, and an Aqueduct of stone and brick masonry, with other incidental work, for that portion of the Croton Aqueduct which extends from the Dam on the Croton to Sing Sing, being between eight and nine miles in length

The prices for the work must include the expense of materials necessary for the completion of the same, according to the plans and specifications that will be presented for examination, as hereinafter mentioned.

The Work to be completed by the first day of October, 1839.

Security will be required for the performance of contracts—and propositions should be accompanied by the names of responsible persons, signifying their assent to become sureties. If the character and responsibilities of those proposing, and the sureties they shall offer, are not known to the Commissioners or Engineers, a certificate of good character, and the extent of their responsibility, signed by the first judge or clerk of the county in which they severally reside, will be required

No transfer of contracts will be recognised.

Plan of the several structures and specifications of the kind of materials and manner of construction, may be examined at the office of the Commissioners, in the city of New-York, from the 10th to the 14th, inclusive, of April next. The line of Aqueduct will be located, and the map and profile of the same, together with the plans and specifications above mentioned, will be ready for examination at the office of the Engineer, at the village of Sing Sing, on the 15th day of April next, and the Chief or Resident Engineer will be in attendance to explain the plans, &c., and to furnish blank propositions.

Persons proposing for more work than they wish to contract for, must specify the quantity they desire to take

The full names of all persons that are parties to any proposition, must be written out in the signature for the same.

The parties to the propositions which may be accepted, will be required to enter into contracts immediately after the acceptance of the same.

The undersigned reserve to themselves the right to accept or reject proposals that may be offered for the whole or any part of the above described work, as they may consider the public interest to require.

STEPHEN ALLEN,
CHARLES DUSENBURY, } Water
SAUL ALLEY, } Commissioners.
WILLIAM W. FOX,
JOHN B. JERVIS,
Chief Engineer, New-York Water Works.

New-York, February 28, 1837. 10 5t

TO ENGINEERS.

WE are gratified to be able to announce to those desiring INSTRUMENTS, that Messrs E. & G. W. BLUNT of this city, are now prepared to furnish at short notice, LEVELS, from different manufacturers, among others from Troughton & Sims, which they warrant of the first quality. Circumferentors, Levelling Staves, Prismatic Compasses, Mathematical Instruments, Books for Engineers, etc. constantly on hand.

One of the above firm is now in England superintending the manufacture of Theodolites, Transit Instruments, etc.—and any orders for Instruments, not now on hand, will be forwarded him, and executed promptly.

*** Orders will be received and promptly attended to by the Editors of this Journal. 9 4t

PRESERVE YOUR RECEIPTS, *especially* for newspapers, and periodicals, as such accounts are more numerous than in most other kinds of business and therefore errors are more like to occur. To avoid errors in our accounts, and to give the parties interested an early opportunity to correct them should they occur, we have adopted the plan of publishing in each number, the name, residence, and *date paid to*, of those who have paid during the week—and we request early information should error be detected by subscribers.

PAYMENTS IN ADVANCE.—Our friends who have so promptly paid in advance, for the current year of the Journal, will please accept our thanks. Those who have been to *busy* to think of such a *trifle*, will have the goodness to receive "*in advance*," our thanks, and then we shall have no occasion

to repeat the expression on receiving their favors.

To those who have been so constantly engaged in *business* as to *omit* to pay for *previous* years, we will merely say—it will afford us much pleasure to receive the amount and record their names as paid to *January* 1838.

RAILROAD AND CANAL STOCKS, in New-York and Philadelphia.

	Price of shares	Offered	Asked
SALES OF STOCK IN NEW-YORK February 27th.			
Mohawk Railroad	t w		88¼
Paterson Railroad			70¼
Boston and Providence	b 50 ds.		108½
New-Jersey Trans.	60 ds.		108
Stonington	b 60 ds.		82
Long Island Railroad	n w		81½
Paterson Railroad	b 90 ds.		75
Stonington Railroad	cash		77
Harlaem Railroad			78½
Utica and Schenectady			121½
Delaware and Hudson Canal			94½
PHILADELPHIA STOCK MARKET. February 24th.			
RAILROAD STOCKS			
New-Castle and Frenchtown	25	31½	32
Do loan, 5½ per cent	100	99	101
Wilmington and Susquehanna	50	38	42
Camden and Amboy, shares,	100	136	136½
Do loan, 6's 1836	100	110	120
Danville and P shares	50	25	35
Norristown, do	50	34	34½
Do 6 per cent loan	100	85	100
Valley Railroad	7½	1	3
Westchester do	50	20	28
Minehill do	50	55	60
N. L. and Penn. Tp. do	40	34½	35
Philadelphia and Trenton do	100	125	127
West Philadelphia Railroad	50	20	30
Harrisburg and Lancaster	50	46	48
Cumberland	25	15	20
Beaver and Meadow	50	57	58
MISCELLANEOUS STOCKS			
North American Coal Company	25	12	14
Steam Bt. Sts. Columbian	100	18	22
Exchange Stock	100	70	80
Arcade	100	55	75
Theatres—Chestnut street	600	625	675
———Walnut street	280	175	220
———Arch street	500	325	375
Gas Company	100	100	102
CANAL STOCKS.			
Schuylkill Navigation, shares	50	164	164½
Do loans, 5 1845	100	98	100
Do do 1855	100	100	101
Do do 5½ 1837	100	98	100
Lehigh Coal and Navigation	50	85	88
Do loan, 6 1833	100	96½	97½
Do do 6 1839	100	97	98
Do do 6 1844	100	99	100
Do do 5 1840	100	96	97½
Union Canal, shares	200	180	190
Do loan, 1836	100	83	86
Do do 1840	100	85	90
Chesap'k & Delaware Canal, shares	200	20	40
Do loan, 1837	100	60	67
Do do 1840	100	60	67
Delaware and Hudson,	100	92½	93
Do loan	100	95	100
Louisville and Portland	100	112½	117
Convertible 6 per cent. loans,	100	110	120
Sandy and Bever	100	60	80
Morris Canal	100	99	100

STEAM MILL.—We understand that the stock for the purpose of erecting a steam mill in this village, with three or four run of stone has been nearly all taken up, and that the work will be speedily commenced.—[Goshen, Oswego Co. Democrat.]

The above paragraph indicates a determination to make Goshen a place of business—and of the success of the measure we have not a doubt, as we understand the company propose to put up one of *Avery's Rotary Engines*—which is probably the most suitable machinery in use for *mills*, either for sawing or grinding.

The manufacturers of those engines, will guarantee the engine to grind *one hundred bushels of wheat* with a cord of maple wood, OR HALF A TON OF LEHIGH PEA COAL and one man will superintend the engine and make the *fire* for ten or twelve hours in the twenty-four.

RAILROADS AND LOCOMOTIVES.

In laying the following communication before our readers, we feel compelled to reiterate the remarks made in publishing other articles on the same subject. As far as we are concerned, and as far as we understand the notions of those who have taken up the performances of Mr. Norris' and other powerful engines, as arguments against the use of stationary power and excessive excavation and embankment in ordinary cases, it is not intended to recommend the adoption of 360 nor ever of 100 feet to the mile as a suitable grade for railroads. No one can be so foolish as to propose these or any other grades as uniformly proper upon railroads, yet many of the remarks in the following communication as well as in others, on the same subject, are predicated upon such a supposition.

We understand these performances only as proofs of the great superiority of our American Locomotives, on any and every grade. There is no doubt but that the experiments on the Columbia Railroad give a greater adhesion than those of any former trials, but of the fact there can be no doubt. We were of a party of 53 persons, in two passenger cars, drawn with the tender up the inclined plane, rising 360 feet in a mile, at the rate mentioned in a previous No., and this without any start, the engine being stationary at the foot of the plane.

We leave the discussion of this subject, as far as the theory is concerned, to those who have time to examine into the matter.

As for Mr. Norris, he goes upon the principle that "facts are stubborn things," and we understand that in a week or two he will be able to make another and more conclusive trial of the power of his engines.

As to the remark in the communication on the blowing off of steam, we consider with the writer that this is no argument at all of superabundant power.

We are always obliged to our friends for communications on this subject; much discussion has already taken place in our paper, and we are convinced with a happy result.

Any remarks, facts or calculations on a theme so prolific and so intimately connected with the science of civil engineering, can never come amiss.

For the Railroad Journal.

FREDONIA, Feb. 7th, 1837.

To D. K. MINOR, and GEO. C. SCHAEFFER,

GENTLEMEN,—I have read in your paper of the 24th December, a Circular, by William Norris, Esq., of Philadelphia, containing an account of some very wonderful feats said to have been performed by his Locomotive Engines, on the Columbia Railroad. Some of these were published last summer, but have not as yet, I believe, been noticed by scientific men, from the fact, I suppose, that the errors in them were so enormous and so apparent, that they supposed they would be detected by all, and were not therefore worth exposing.—But the mass of those who read these accounts, now again put forth as facts, and who are interested in Railroad Improvements, are not scientific men, and it is to prevent such from daily quoting and swallowing absurdity with such grave astonishment, that I send you the following exposition. I have not the least desire to prejudice community against Mr. Norris' engines, which I have no doubt are really very superior ones, but I do not wish capitalists to mistake *steep* roads for *cheap* ones, or to suppose they are going to draw loads which are really impossible for Mr. Norris' engines or any others.

I shall confine myself to the first and last articles of this Circular, merely premising that the others are records of deeds done in equally flagrant and open violation of the laws of gravitation. In the first article in this Circular, taken from the Railroad Journal, of July 16th, 1836, it is stated that the engine "George Washington" started at the foot of a plane, having an inclination of $\frac{1}{100}$, without previously acquired velocity, and went up said plane at the rate of 15½ miles per hour, drawing a load of 19,200 pounds, with a pressure under 60 pounds per square inch in her boiler.—Now the resistance to motion which an engine must overcome when ascending an inclined plane, is composed of the following items, viz.:

1st. The friction of the load=8 pounds per ton of said load.

2nd. The gravity of the whole mass= the whole weight multiplied by the size of the inclination.

3rd. The additional friction caused in

the engine by the load it draws=1 pound per ton of said load, including gravity; and

4th. The friction of the engine without load, which varies with different engines, but is never far from 15 pounds per ton weight of the engine.

In the case before us, the friction of the load $= \frac{8 \times 19200}{2240}$ =68.56 pounds, 68.56

The gravity of the mass =34130 $\times \frac{7}{100}$ = 2389.10 pounds, g=2389.10

This being divided by 8, gives 298.63, to which adding 8.57 (the weight of the engine in tons), gives a total load=307.20 tons on a level, 307.20

which causes therefore an additional friction of 307.20 pounds, 100.00

R=2864.86

The friction of the engine without load $= \frac{15 \times 14930}{2240}$ = 100.00 pounds, making in all, a resistance R=2864.86, to which the power applied to the engine must at least be equal, in order that it should advance.

The dimensions of the "Goorge Washington" are thus given:

D=diameter of driving wheels =48 inches, D=48

d=diameter of cylinders =10.25 inches, d=10.25

l=twice the length of the stroke=35.25 inches, l=35.25

W=weight of engine=14.930 pounds, W=14.930

w=adhering weight=8700 w=8700

π=3.1416

The area of both pistons will be $\frac{1}{4}\pi d$= 165 sq. in., which being multiplied by 60, the pressure per square inch, *below* which it is stated the engine worked, and we have 9900 pounds power applied to the pistons; but as the power applied to two different points in the same machine is in the inverse ratio of the velocity of those points, and as the velocity of the piston is to that of the engine, as twice the length of the stroke to the circumference of the driving wheels, the 9900 pounds power applied to the piston, must be multiplied by the ratio $\frac{l}{\pi D} = \frac{1}{4.278}$ to transfer it to the engine. This gives the power of the engine p=2314.16 pounds, which it will be seen by refering to the table of resistances above, *was insufficient to overcome the force of gravity*. Therefore supposing the "George Washington" to be one of those Utopian Motors, which move themselves and their loads without a pound of friction, yet the feat is impossible, without we can also "suspend the rule," with reference to the immutable law of gravitation. In the case of no friction, the engine placed upon the plane, with the forces applied exactly as stated to have been, instead of going *up* the grade, would go *down*, impelled by a constantly accelerating force, equal to $(g-\rho)$=75 pounds. *Actually*, the engine would have remained in equilibrium on the plane, the surplus of gravity over the power of the engine being insufficient to overcome the friction which retards the *downward*, as well as the upward motion.

The statement thus demonstrated so vitally wrong, ones confidence in the whole experiment is greatly impaired. For instance, I am inclined to believe, that the load actually drawn up the plane, was not so great as stated, since this gives for the adhesion a value of about $\frac{1}{3}$ the adhering weight, which is more than twice as great as any yet observed elsewhere. But supposing the load to have been exactly as stated, then the pressure in the boiler and cylinders must have been enormously greater. It is easy to calculate *how much* greater it must *necessarily* have been.—The analytical expression for the effective pressure in the boiler of an engine, in order that it may draw a given maximum load, is thus given by Pambour, $\rho - \delta = \frac{D(9M+F)}{\frac{1}{2} l d^2}$ in which ρ represents the elastic force of the steam, δ=the atmospheric pressure per same square unit, and F, the friction of the engine without load. In this formula, putting for the Algebraic quantities their values, we have the effective pressure $\rho - \delta = \frac{48 \times (2763+100)}{(\frac{1}{4})^2 \times (\frac{1}{8})}$ = 74.2, so that the engine must have worked at the pressure of 74.2 pounds per square inch.

The Editor of the "National Gazette" concludes his comments on this performance with the following: "It is remarkable that the engine was blowing off, on her arrival at the top, having acquired *speed!* and power during the ascent." It is indeed "remarkable" that this sapient editor did not know, that the blowing, instead of indicating a gain of speed, was occasioned by the loss of it. If an engine goes a certain speed, and if by some obstacle her speed is reduced to one half, the fire being animated the same as before, about the same amount of steam is generated in the boiler in the same time, while only half the number of cylinders of steam is used—the consequence is, that the pressure rises in the boiler which lifts the valve, and causes the blowing which was so edifying to the Editor of the Gazette.

I now come to the last article in the Circular, wherein Mr. Norris states that the engine, "Washington County Farmer," drew 141¾ tons, over a rise of 47 feet per mile, at the velocity of 22 miles per hour. In this case, the whole resistance R=4759 pounds. The dimensions of this engine are not given, but supposing the ratio $\frac{l}{\pi D}$ the same as in the "George Washington," and the diameter of the pistons=11 inches, such an enormous pressure is required as to throw an air of incredulity over the performance. Please give if you can, the dimensions of this engine, and the pressure employed on this occasion.

Your obedient servant,

A. G. STEERE,

New-York and Erie Railroad.

From the Philadelphia Commercial Herald.

RAILROADS, &c.

The fair prospect of having shortly in actual existence, a concatinating rout, for such velocity of transition as is afforded on railroads, and by steamboats on navigable rivers, between Portland in Maine, at the North-eastern extremity of the Union, and New-Orleans in Louisiana at its opposite extreme a distance of 1745 miles; is a matter of lively gratulation; and what, ten years ago could not have been anticipated by the most sanguine; nor could hopes, now reasonable, have then been cherished of the rapidity with which it seems this country is destined to arrive at greatness unparalleled by any other nation whilst in a state of adolesence. But it is now an unquestioned fact, that the vast project is not only in great progress, but likely soon to attain its consummation.

PORTLAND, prior to the year 1832, was the seat of government for Maine; and in 1830 contained a population of 12.601 persons. For commerce it is conveniently located, one of the finest harbors on the continet, easy of access and seldom frozen over. From this place to DOVER in New-Hampshire a Rai road has been incorporated. The distance is 52 miles. Dover is a flourishing town at the head of the tide on the Cocheco 12 miles north-west of Portsmouth, on the Piscataqua, a river into which the Cocheco empties.

PORTSMOUTH is the largest town in New-Hampshire, and in 1830 its population was 8,082. The harbor is excellent, easy of access, and owing to the AGITATION OF THE WATER from the rapidity of the tide, NEVER FROZEN. In 1836, a railroad was incorporated, and it was commenced in July of the same year—to extend between this town and BOSTON, in Massachusetts, and is now in progress. Its location is by NEWBURYPORT, a distance of 25 miles; thence by SALEM 20 miles, which is 14 miles from Boston. Salem is the second town in New-England for commerce, wealth and population, which, in 1830, was 13,886. The po-

pulation of Newburyport, the third commercial town in the State, was at the same period 6,388.

From Boston there are several routes to NEW-YORK. That by the Boston and Providence Railroad, 41 miles in length, has been in use since June 1835; where two trains of cars for passengers pass through each way daily, Sundays excepted; and another, called the steamboat train, connected with the New-York and Providence steamboat line, conveys passengers to and from Providence every day the steamboat arrives there and departs thence.

That by Providence, and extending thence to Stonington, Conn., 47 miles, is in progress and expected soon to be completed, and will be connected by a ferry, 25 miles across, from Stonington to Greenport, Long-Island, with the Long-Island Railroad, 98 miles long; together 211 miles from Boston to New-York.

The other route is by the Boston and Worcester Railroad, 44 miles in length to Worcester, on which, trains of cars for passengers pass through each way two or three times daily, Sundays excepted. The Western Railroad, extending from Worcester to the Connecticut river at Springfield, 48 miles, and thence to the boundary line of the State of New York, where it will unite with railroads in progress to Albany, to Hudson and to Troy, was commenced in 1836. In the same year a railroad from Springfield to Hartford, Connecticut, 28 miles, was incorporated, which will meet one in progress from Hartford to New-Haven, 34 miles; thence to New-York, the distance is 76 miles. In all, by this route between Boston and New-York, 230 miles. Between New-York and Philadelphia two routes exist. The one by steamboat from New-York to South Amboy, in New-Jersey; thence by the Camden and Amboy railroad, which was completed in 1832 to Bordentown, passing Spottswood and Highstown, 35 miles; and thence through Burlington to Camden on the river Delaware, opposite Philadelphia, 26 miles; total 61 miles from Amboy. The whole distance probably 85 miles through, during the greatest portion of the year, whilst no danger of obstruction by ice is apprehended. Steamboats are the vehicles of conveyance between Bordentown and Philadelphia on this route. The time occupied in the passage from New-York to Philadelphia, this way is 7 or 8 hours.

The other communication between those two cities is by the New-Jersey Railroad, extending from Jersey city on the river Hudson opposite New-York, through Newark, Elizabethtown, and Rahway, to New-Brunswick 31 miles in two hours. This road is in progress of continuation to the Delaware Bridge at Trenton 27 miles to meet there, the Philadelphia and Trenton Railroad, 26½; total 85 miles.

Between Philadelphia and Baltimore there are 2 routes—one, by Steamboats on the river Delaware, 33 miles to New-Castle, in the State of Delaware, thence by the New-Castle and Frenchtown Railroad. 16 miles completed in 1832, and thence on the Susquehanna river, Chesapeake Bay and the Patapsco river by Steamboats to Baltimore. The whole distance upwards of one hundred miles. The other route, not yet completed, is the Philadelphia and Baltimore Railroad from Philadelphia to Wilmington, in Delaware, there to be united with the Wilmington and Susquehanna Railroad, which forms a junction with the Baltimore and Port Deposit Railroad at Havre de Grace. Distance from Philadelphia to Baltimore 93 miles.

From Baltimore to the city of Washington, 40 miles by the Baltimore and Ohio railroad, thence by the Baltimore and Washington railroad 31 miles; completed in 1835; the whole distance, 40 miles. From Washington, the metropolis, by steamboat on the Potomac, passing, on the right bank Alexandria, to the termination of the Richmond, Fredericksburg, and Potomac railroad 50 miles.

Alexandria is a city of extensive business, containing a museum, in which are deposited, among other rareties, an elegant satin robe, scarlet on one side and white on the other, worn by General Washington when he was baptized; a penknife with a pearl handle, presented to him by his mother in his twelfth year; a pearl button from the coat he had on at his first inauguration as President of the United States; a black glove which he wore when in mourning for his mother; a part of the last stick of sealing wax he used; the original of his last letter, written by him, apologizing in behalf of Mrs. Washington and himself, for declining an invitation to a ball at Alexandria; a beautiful Masonic apron, with the belt of scarlet satin, and the white kid gloves worn by him the last time he participated in the social ceremonies of that institution.

From this termination, the said road, which will soon be completed, is located over the river Rappahanock, through Fredericksburg, a place of considerable commerce, to Richmond, the seat of Government for Virginia, and in a beautiful and picturesque site, at the head of the tide, and at the falls of James river, and the largest town in the State, favorably situated for trade and manufactures, with an extensive commerce; 58 miles.

From Richmond to Petersburg, a railroad was incorporated last year. Petersburg is on the river Appomatox, at the head of the tide, the third commercial town in Virginia, and its trade in flour, tobacco and cotton, is considerable.

From Petersburg to Blakely, on the river Roanoke, 59 miles, a railroad is in operation; from thence, a railroad has been incorporated to Raleigh, and is now in progress. Raleigh, 148 miles from Richmond, is pleasantly situated near the centre of North Carolina, and the seat of the State Government.

From Raleigh to Fayettville, regularly laid out near the West bank of Cape Fear river, at the head of navigation, and one of the most flourishing towns in North Carolina, a railroad has been projected—and another, thence to Charleston, South Carolina, in order to complete the line from the Potomac by Fredericksburg, Richmond, Petersburg, and Raleigh to Charleston. Between the two last named cities, the distance is about 274 miles.

From Charleston to Cincinnati, Ohio, a railroad is projected, and charters have been obtained from the legislatures of all the States through which it is to pass, and the distance computed at 607 miles. Thence it is designed to be continued to Louisville, Kentucky, 93 miles. From whence the communication is on the rivers Ohio and Mississippi, to New-Orleans.

From Charleston, South Carolina, the South Carolina railroad extends to Hamburg, on the river Savannah opposite to Augusta, 136 miles, and was completed in 1833.

From Augusta, Ga., a railroad is in progress to Athens, a distance of about 100 miles. And from the same city of Augusta, a railroad is projected to Columbus, on the Chattahooche, 210 miles; thence to Pensacola in Florida, about 110 miles, passing by Monticello and Montezuma.

From Baltimore to Wheeling, on the river Ohio, a railroad has been in progress since 1828. The distance is about 360 miles.

From Philadelphia to Pittsburg, situate at the head of the river Ohio, an eligible route has been ascertained for a railroad, which, no doubt, will be constructed before a lapse of many years; when a passage may be made over land from Portland, in Me., to Pittsburg, at a moderate calculation in the space of three days, whence steamboats ply on navigable rivers, to New-Orleans.

This sketch, it will be perceived, delineates the most prominent routes from the extreme north-eastern State in the Union, on the Atlantic, to the extreme south-eastern Territory, with three lateral divergences to New-Orleans. And should the progress of improvement that has taken place within the last ten years, continue undisturbed, before the expiration of ten years more, the journey between Portland and New-Orleans, will be effected in six days. X.

ILLINOIS INTERNAL IMPROVEMENTS.

The folowing extract from the *report of a "Committee on Internal Improvement,"* to the Legislature of Illinois, evinces a disposition to keep pace with the other States of the Union—*Illinois* could not be expected to do less—more could hardly be expected from the oldest and most powerful States in the Union.

The works which your committee have concluded to recommend to the consideration of the house, are given in the annexed schedule, together with the estimated costs and amount appropriated to each, viz:

1st.	Improvement of Great Wabash River	$100,000
2d.	Improvement of the Illinois River	100,000
3d.	Improvement of Rock River	100,000
4th.	Improvement of Kaskaskia River	50,000
5th.	Improvement of Little Wabash River	50,000
6th.	Improvement of Great Western mail route	100,000
7th.	Central Railroad from the mouth of Ohio to Galena	3,500,000
8th.	Southern Cross Railroads	1,600,000

9th. Northern Cross Railroads	1,850,000
Amounting to	$7.450 000

The said several works and the routes of the said railroads, are particularly described in a bill for "An Act to establish and maintain a general system of Internal Improvement," accompanying this report.

The estimated average costs of the respective railroads per mile. your committee have put a fraction less than eight thousand dollars, and have judged of the respective length of each, from the maps of the State, executed from that derived from the public surveys. From a topographical knowledge of the country, derived from the personal obsereation of different members of the committee, it is believed, that the sum of four thousand dollars per mile, on an average throughout the State, will be a liberal estimate for the graduation and bridging of a road bed adapted to a double track railway; and your committee have supposed, that four thousand dollars per mile, will be sufficient to lay down a substantial single track railway, adapted to locomotive power, and to the transportation of the bulky staples of the State, at the cheapest rates of tolls and chargrges. A single track railway, with necessary turn outs in suitable parts, to admit the passage of the trains moving in opposite directions, will alone be necessary, and prudent to construct in the first instance; and the facilities afforded by the track in laying down an additional one which may be deemed necessary by the Legislature, and materially reduce the cost of constructing the second track.

TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

It is seldom that we are enabled to give our readers so great a treat, as they will have in the perusal of the papers from this valuable work.

It is well known, that the most eminent engineers in England have formed an Institution for the advancement and improvement of Civil Engineering as a profession. The papers read before the society, some by the most distinguished members of the profession, have been collected in the elegant and costly work now before us, but few copies of which are in the United States.

We hasten to lay before our readers the various papers, as rapidly as the cuts can be prepared.

The expense of the work and its scarcity, will prevent the members of the profession (with but few exceptions) from obtaining even a sight of the Vol., we have therefore, without hesitation, determined to give as great a circulation to its usefulness as possible, though the expense incurred is not trifling, while our readers are enabled to have before them the cream of a work, costing double our yearly subscription, and not to be had for that, as it is only furnished to the few subscribers in this country.

We have already endeavored to give whatever may be new and useful to the profession, and our exertions shall not be intermitted,—the present No. is given as a guarantee of our promise.

We give in this No. the following papers:

On procuring supplies of Water for Cities and Towns, by boring. John Seaward, Esq., M. Inst., C. E.

Some account of several sections through the Plastic Clay formation, in the vicinity of London. William Gravatt, Esq., F. R. S., M. Inst., C. E.

Some account of Boring for Water in London and its vicinity. John Donkin, Esq., M. Inst., C. E.

ON PROCURING SUPPLISES OF WATER FOR CITIES AND TOWNS, BY BORING. COMMUNICATED BY MR. JOHN SEAWARD, M. INST C.E.

A French gentleman of our anquaintance having recently addressed upon a project of supplying the different towns of France with water, by means of boring in the earth, according to the method which has come lately a good deal into fashion in different parts of England, and thus having brought the subject under our mature deliberation; we offer the following remarks, which we were led to give in reply, with the hope that they may be found not altogether uninteresting to the Institution.

In the first place, as respects the project of furnishing water to the different towns of France by means of simply boring in the earth; if by this is intended that the various towns are to be supplied with water economically, for all domestic and manufacturing purposes, in the same abundant manner that it is furnished to the inhabitants of London and other towns of England, we must at once declare without any hesitation that, as a general principle, the scheme will be abortive, and if attempted will infallibly end in loss and disappointment.

In stating thus explicitly our opinion, we do not wish to be understood as being anywise unfavorable to boring in general; on the contrary, as an art when employed under suitable circumstances, we know that it can be made, on various occasions, highly subservient to the wants of man, but we also know that with many persons, a very erroneous opinion prevails as to the economy, and other merits and advantages of the art.

The method of "simple boring," as it is called, is not adapted for all situations and places; it requires a combination of circumstances not generally met with; London and the surrounding district, wherein this art has been most successfully practised, is highly favored in this particular; the stratum of soil is a bed of clay, varying from 100 to 200 feet thick, and is therefore very easily bored through. It is remarkable that the springs under the bed of clay produce the finest and most salubrious water, while those above the bed of clay produce water so impure as to be unfit even for the most ordinary purposes. It is therefore easy to conceive, that this method would here meet with the most favorable encouragement, but in districts where the same circumstances do not exist, there would not be the same inducement to follow it.

"Simple boring," is suitable only when the quantity of water required is comparatively small: thus if the object be to furnish a very superior water for a nobleman's mansion, for a small village or neighborhood, or even for a single manufactory, then this method is admirable, provided the circumstances are in any proportion as favorable as in the district which surrounds London; but if the question be to provide an abundant supply of water for a large town or populous city, then certainly in every case, the method of boring should, on the score of economy, be the last that ought to be resorted to for the purpose.

That the bowels of the earth contain springs of water in abundance, there can be no doubt; miners and colliers are aware of this fact to their cost and sorrow: but we know full well that those same springs, if they have sufficient natural force, must find their way to the surface of the earth somewhere, without any boring, and thon form rivers and flowing brooks. Why then delve a great depth at an infinite expense, to procure that which we can generally obtain so readily and economically on the surface of the earth?

There is scarcely a city or town of any magnitude but what has some fine river or copious brooks in its immediate neighborhood, these are the natural sources whence we should obtain our supply of water; but if the streams in the vicinity are so impregnated with deleterious matter, as to render the water unfit for domestic or manufacturing purposes, and if no ready method can be adopted for cleansing it, recourse should then be had to the water that falls from the heavens; tanks and reservoirs, (similar to those employed in feeding navigable canals,) should be formed in convenient situations, to receive the rain-water which falls on the adjacent hills: either of these means would furnish an abundant supply of this necessary element constantly and economically.

It is perfectly true, that a populous town may be so situated as to be at an inconvenient distance from any salubrious river or brook, whence to obtain water, and local circumstances may be such as to render it impossible or inexpedient to form in the vicinity tanks or reservoirs to collect the rain-water from the hills; in this case, there appears to be no alternative but that of obtaining a supply from the bowels of the earth: in such case, it will be necessary to sink very capacious wells or shafts to a great depth, with suitable pumps and steam-engines, to bring the water to the surface; and even then the supply may be so scanty as to render it necessary to drive (in various directions) horizontal levels or galleries from the bottom of the wells or shafts, in order to break in upon the springs which may exist at a distance; similar to the method practised in the salt-works of England, to obtain a copious supply of the brine; but in such case to expect that by simply boring down into the earth, a plentiful supply of water can be obtained for the domestic and manufacturing purposes of a populous town, is to expect what rarely or never can be accomplished.

The modern plan of boring to obtain water has been, without any rational grounds

cried up as a new and wonderful discovery, but the truth is, that boring is an operation of great antiquity; the miner and collier make use of it in a variety of ways, and it has from time immemorial been a useful auxiliary to the well-digger; he employs this process to discover where springs of water exist. By this means he can at a comparatively small expense determine whether the situation is favorable or not for forming a well; at the same time he can ascertain the quality of the water when obtained, and the probable ultimate expense which must be incurred in order to secure a regular supply.

In some instances it has happened that in boring, from the cause just stated, the water has of its own natural force risen up through the hole, and flowed over the surface in considerable quantity, and thus, without much further trouble or expense, a tolerably copious supply has been obtained. This circumstance it is that has brought into favor the idea of depending on simple boring alone as a regular systematic method of obtaining a supply of water; and it is but right to say, that the method, in many instances, has been remarkably successful; but it should be borne in mind, that the supply, copious as it is called, has scarcely in any one instance exceeded what would be required for a moderately extensive manufactory, or for the domestic use of a very small village; moreover although considerable success has attended many of the experiments made to obtain water in this way, yet it is most certain that, as regards the obtaining of an abundant supply by the simple process of boring alone, in a majority of cases, the method has *completely failed*; and, after a very heavy and useless expense and loss of time has been incurred in these failures, recourse has at length been had, either *partially or wholly*, to sinking a well.

The most rational plan for obtaining a good supply of water from under-ground is in the first place to sink a well to about half the depth at which it is supposed the spring of water exists; thus, if the spring is judged to be 100 yards below the surface, then the well may be made 50 yards deep; this being properly built up and secured, the engine erected, and suitable pumps fixed, the remainder of the depth to the spring may be pierced through by the process of boring, and in this way a copious supply of water is frequently obtained, and as may be readily judged, the quantity of water obtained will vary according to the greater or less depth to which the well is formed; but at the same time it should be observed, that the deeper the well, the greater will be the expense of raising the water to the surface.

If necessary we could here enumerate a long list of losses, failures, and consequent disappointments, which have attended the process of boring, within our own observation; for the present, however, we shall confine ourselves to two instances.

About four years ago we erected, almost in the heart of the metropolis, a 14-horse condensing engine for a manufacturing purpose. As a good supply of water was wanted for that and other objects, the proprietor of the establishment thought he could obtain this necessary element on his own premises, and make himself independent of the water-companies. We recommended him to sink a well at once; but contrary to our advice, he determined to try the process of simple boring, the situation of his premises being judged very favorable for that purpose. A hole was consequently bored to about 100 yards deep, and after some labor and expense water was obtained, but the supply was so scanty as not to be half sufficient for the 14-horse engine; several attempts were made to remedy this but without effect; the hole was at length abandoned, and a well was then formed, though not so deep as it should have been; boring was then resumed to the depth of what was considered the main spring; pumps were put down the well, and water was again obtained; but even after all, the supply was barely sufficient for the engine. The result of this business was, that the proprietor after having his premises in confusion for nearly two years, in the end expended double as much money as would at once have formed a good productive well, and the interest of the money expended is considerably more than he would have had to pay to any water-company for all the water he required for his engine and manufactory, besides losing a considerable portion of the power of his engine, which is expended in drawing the water to the surface.

Within a quarter of a mile of the above-described well was situated a brewery furnished with a similarly-constructed well, from which a considerable supply of water had been obtained; it is, however worthy of remark, that no sooner did our engine commence drawing water from the new-formed well, than the brewers immediately lost a great part of the supply they had previously been accustomed to derive from theirs; the consequence was, they were under the necessity of sinking it deeper, and of putting up more powerful pumps, in order to obtain their former supply.

We mention the above fact to show that, although there is no question but it is possible to find a spring of water in almost any situation, yet the springs do not furnish that inexhaustible supply of water which some persons imagine; indeed a bare consideration of what is accomplished in mines and collieries must convince us of the truth of this fact; were the springs of that inexhaustible nature some pretend, not a single mine or colliery in the universe could be worked to any moderate extent whatever.

The second instance of failure in boring, which has happened in our own practice, we shall now proceed to relate. About twenty years ago a canal was cut in the neighborhood of London which passes over a very hilly tract of land, and in the summer months there is great difficulty in obtaining a sufficient supply of water for the upper level. It is true the canal passes very near some copious brooks and streams, which with little expense or trouble might have been made available to supply every deficiency twenty times over; but from some circumstances the proprietors of the canal were not permitted to take advantage of these facilities, and as the rain-water they were enabled to collect from the hills was inadequate, they were under the necessity of resorting to the bowels of the earth to supply the deficiency. For this purpose, a large hole was bored down at the side of the canal, to a depth of two or three hundred feet, to what was understood to be the main spring; the water speedily rose and flowed over the surface; however, it was soon discovered, that the quantity obtained by this means was so very small as to be of no practical utility: a well of large dimensions was then sunk down about 80 feet, the boring still continuing to the original depth; pumps were fixed, and machinery worked by horses; the supply of water by this means was increased tenfold, but still was inadequate for the purpose required. We were then employed to erect a steam-engine with suitable pumps, &c., and the well was sunk to double the original depth; a much more copious supply was now obtained, and the navigation thereby greatly assisted; but after all, the expenses attending these works, and the pumping up the water from such a depth, and that too still inadequate in quantity, are evils of such a serious magnitude, that these joined to other circumstances attending this property, will probably before long cause the whole of the concern to be abandoned.

We could add many other instances of the total failure of what is called the simple boring system; of works begun and never finished to any useful purpose; of others pertinaciously carried on for four or five years, until the patience and the funds of the parties were alike exhausted; but we think enough has been stated above to prove to your satisfaction, how very uncertain has been this method of obtaining water. We think it right, however, to guard against the impression that boring for water is a bad system; on the contrary, allow us to repeat that we think most highly of it; but then only under proper management, and as a useful auxiliary to the sinking of capacious wells.

With respect to the project generally, of forming a regular establishment for the purpose of supplying water to the various towns of France, we have to remark, that there can exist no physical impediment to the accomplishment of the plan; there is no question but every town in France might be made to enjoy the same inestimable advantages possessed by the inhabitants of London and other towns of England; that is to say, a constant, abundant, and an economical supply of good water, for all purposes of domestic and manufacturing use; but of the three modes by which this can be accomplished, the one by boring or well-sinking is decidedly the most expensive, and the most uncertain in the final results.

SOME ACCOUNT OF SEVERAL SECTIONS THROUGH TAE PLASTIC CLAY FORMATION IN THE VICINITY OF LONDON. BY WILLIAM GRAVATT. F.R.S., M.INST.C.E.

TRING HILL, HERTS.

A boring for water for the Grand Junction Canal commenced at 25 feet below the summit level of the hill near Marsheroft Bridge.

Chalk	20 feet.	
Hard blue clay	30	
Blue stone	4.	At 54 feet the water rose to the top, and ran over 1300 cubic feet in 24 hours.

Hard blue clay	47	
	101	feet—no more water than at 54 feet.

The boring discontinued in Nov. 1827.

A second boring in the same hill commenced 20 feet from the summit level.

Chalk	30	feet.
Hard blue clay	34	
Blue stone	4.	Water rose up. The stone required punching before using the auger.
Blue clay	82	Strata of indurated clay at about every 4 feet, so hard as to require punching from 2 to 10 inches.
Black grit	10	
Blue clay	108	very hard.
	268	feet. Boring discontinued—no more water than at first. These two borings cost £145 and were 3 months in hand.

NORWOOD, NEAR STANDWELL.

A well 4 feet diameter sunk and bricked 280 feet through blue clay, into sand; the instant the sand was reached, the water rushed up to the top so fast as to endanger the workmen; it now stands within 8 feet of the surface of the canal, which is 86 feet above Trinity high water-mark.

BORING AT BRENTFORD, SIX MILES FROM LONDON.

Brick earth	9	feet.
Sandy gravel	7	
Loam	5	varies from 1 to 9 feet.
Sand and gravel	4	varies from 2 to 8. Contains water.
Blue clay	200	
	225	feet. Boring discontinued—still in clay.

WOOLWICH SANDPITS.

Alluvium of various depths.

Rolled flints with sand	12	feet.
Clay, striped brown and red, a few shells	6	water, merely drops.
Blue and brown clay, many shells	9	
Iron shot sand, with ocherous lumps	9	
Greenish sand, *clean*	8	
Greenish sand with flint pebbles	1	
Light ash-colored sand, perfectly clean	35	
Green sand, with green chalk	1	
Chalk		unknown.

PLUMSTEAD COMMON.

Shafts for Chalk.

No. I. Alluvial gravel, and pure ash-colored sand	120	feet.
Chalk penetrated to	24	
	No water at 144	
No. II. Alluvial Gravel	36	

Stopped by the water.

No. III. At a small distance from this, stopped again by water at the same depth.

N. B. These three shafts were in the same field,

BOSTON HEATH, NEAR WOOLWICH.

A well sunk for water.

Gravel	65	feet.
Sandy beds	65	
Chalk	70	
	200	

The water stands only five feet deep in this well; a trifling supply of water was found in the gravel.

LEWISHAM LOAM PIT HILL.

Alluvium various.

Striped sand, yellow, fine, and iron shot	10	feet.
Striped loam, and plastic clay, with thin seams of coaly matter	10	
Yellow sand	3	
Lead-colored clay, with casts of leaves	2	
Brownish clay with cytherea	6	
Three thin beds of clay, the upper and lower with cytherea, and the middle with oysters.	3	
Loam and sand	4	
Iron shot sand, with flint pebbles	12	
Coarse green sand	5	
Clean ash colored sand	35	
Green sand	1	
	91	

Chalk with nodules of flint unknown.

REDRIFF DRIFT SHAFT.

	Ft.	In.
Vegetable mould	6	9
Brown clay	0	9
Gravel with water	26	8
Blue clay	3	0
Loam	5	1
Blue clay, with bivalve shells	3	9
Gravel and calcareous rock	7	6
Light blue soil with pyrites	4	6
Green sand	1	9
Leafy clay	8	4
	68	1

A pipe sunk by Mr. Turner 95 feet deep, near Bermondsey new church;—when they reached 80 feet, the rod sunk down 15 feet at once; after pumping out several tons of green mud, the water rose to within 25 feet of the top; it rises and falls about three feet with the tide; the water is quite clear and tasteless. At a place not 500 yards from this, they sunk a pipe 190 feet with very little success, the water being out of reach of a pump, and appearing bad.

SOME ACCOUNTS OF BORINGS FOR WATER IN LONDON AND ITS VICINITY. BY MR. JOHN DONKIN, M.INST.C.E.

PARTICULARS OF A WELL SUNK AT THE EXCISE OFFICE, IN BROAD-STREET LONDON.

In the first place, after excavating the upper stratum of gravel and loose soil, four cast-iron curbs were sunk, each 6 feet long; the lowest of these entered the clay about 3 feet; the digging was then continued through the clay to the depth of 140 feet, and a curb of brickwork within the iron curb was sunk the whole depth in the ordinary way, the iron curb serving merely to support the upper stratum, and to prevent the land water getting into the well. Boring was then resorted to, to the depth of about 20 feet, when the water appeared, and rose to within 60 feet of the top of the well; a copper pipe was then driven through the last-mentioned 20 feet, to keep the passage open for the supply.

WELLS SUNK AT MESSRS. BRANDRAM'S VITRIOL AND WHITE LEAD WORKS, LOWER ROAD, DEPTFORD.

The wood and brick curbing was sunk barely 30 feet; the bricks were laid in Roman cement to keep out the water from the land springs; the well was then bored to the depth of about 180 feet into a bed of chalk, from which the soft water rises and flows to within 9 feet of the top of the well, through wrought iron tubes riveted together. The strata are chiefly composed of yellow and green sand and gravel, like those found at the tunnel under the Thames.

ACCOUNT OF BORINGS MADE NEAR LONDON, WHERE THE WATERS RISES ABOVE THE SURFACE OF THE LAND.

In Mr. Wilmot's garden at Isleworth, a boring was executed to the depth of 327 feet. The blue clay was found to exist from about 24 feet below the ground level, with little variation of color, to the depth of 240 feet: it is then of a lightish red, and afterwards of a darker color very much variegated. At the depth of 308 feet it is blackish, and at 310 feet very black; at 311 feet it becomes yellow for some depth; then light green, followed by dark green, out of which the water rises, being a stratum of about 10 feet thick.

All the specimens, with the exception of the yellow, appeared to be clay; the yellow had a sandy appearance. The cast-iron pipe is sunk 327 feet, and is 2¼ inches diameter. The water rises about 10 feet above the ground, and the well supplies eight gallons per minute. The land water here stands about 16 feet below the ground.

Lord Cassilis* has also had a boring executed in his grounds at Isleworth, to the depth of 290 feet; the quantity it supplies is about 30 gallons per minute, and its water rises about 30 feet above the level of the surface.

* Now Marquess of Ailsa.

From the Chicago American.

RUINS OF THE ANCIENT CITY AZTALAN.

We have received from N. F. Hyer, Esq., of Milwaukee, a correct diagram of these ruins, prepared from actual survey, and we confidently furnish it to our readers as a statement to be relied on.

It will be seen that it differs in some respects from the account sometime since published by us, but that account was as correct as could be obtained from the then imperfect and slightly investigated state of the discovery. These ruins form a new and prominent attraction among the many the west affords, and illustrate and confirm some of the theories and opinions of scholars in relation to the early character of the western territory. Much credit is due to the enterprise and taste of those to whom the public is indebted, for the knowledge and particulars of this discovery; and affording, as it does, a fine field for the research of the antiquarian, illustrates the importance of those scientific institutions that are forming in this new and comparatively unexplor-

ed section of our country, for the developement of its mysteries and the record of its discoveries. We are gratified to have our former account and opinion of these ruins thus materially confirmed, and hope that the enterprise and intelligence of our western citizens, operating upon a spacious theatre, rich in wonders, will cause this to be among the first only in a train of discoveries for future record and admiration.

THE CITADEL.

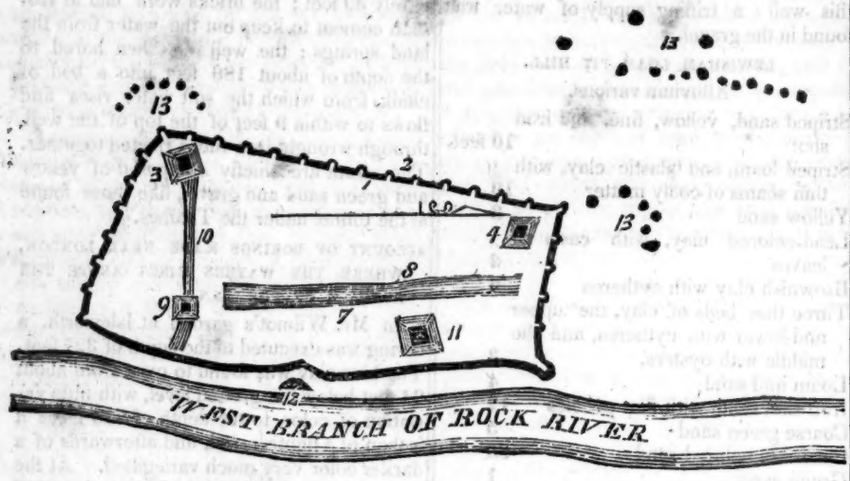

Figure 1 represents the brick Wall, which at the base is 23 feet wide, 4 or 5 feet high, and 84 rods in extent.

2. Buttresses, 23 feet wide, and extending beyond the Wall 17 feet.

3. A square Mound or Plain, 15 feet high, and 53 feet square on top.

4. Mound, or elevated Plain, similar to No. 3, except on the top.

(5 refers to a Cellar 3 or 4 feet deep, and 6 to a Stairway, in figure 4, which our engraver found difficult to accurately delineate, and therefore have been left out.)

7 and 8 are parallel ridges of 2 feet in height, including a smooth Plain, or Road, and extending through the interior of the Fort.

9. Square Mound, with high ground leading to the river.

10. Ridge connecting Mounds, or what might have been Towers.

11. Plain, with slight elevation.

12. The termination of a Sewer, about 3 feet below the surface, and arched with stone.

13. Mounds, varying in size from 3 to 25 feet in height, and from 1½ to 15 rods in circumference.

Besides the mounds which appear on the plat, there are many others, of various sizes, to the northwest.

The enclosed diagram is intended to represent the ruins of the citadel as they now appear, together with some of the surrounding mounds, or tumuli; all which is taken from actual survey and measurement.

These ruins are situated in the town of Jefferson, directly west from Milwaukee, on the West side of the West branch of Rock River, township seven North, range fourteen East.

The weather was very tedious when I surveyed these ruins, and the ground being frozen, the examination was not extended so far as I could wish; but I intend to make a more thorough examination in the spring. The walls were not originally of the width here described, as they would naturally spread out as they crumbled down; and in measuring the width, I have taken an average as it now appears.

There is much here to indicate that this has once been the location of an ancient walled-city, of some miles in extent; but as I have not examined it sufficiently to give a definite opinion, I will leave the subject to the examination of the antiquarian and the curious; and to them I would say, that there has recently been a settlement commenced in the vicinity, where they can pursue their researches without the necessity of "camping out."

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To the Editor of the Chicago American:

Sir: I see by the papers that you have published a description of the "Ruins of the Ancient City of Aztalan." I have not seen your publication, but suspect that it is not quite correct, for at that time no accurate survey had ever been taken; and I am not aware that any description was ever given but that furnished by me; and that being taken from observation merely, was found on actual survey to be somewhat incorrect, but the description above given can be relied upon.

Respectfully yours, &c.

N. F. HYER.

Milwaukee, Feb. 4, 1837.

BUILDER'S MANUAL.—The importance to the community, of a correct knowledge of building, induces us to re-publish in the Magazine "the *Builders Pocket Manual*, containing the elements of BUILDING SURVEYING, and ARCHITECTURE, with practical rules and instructions connected with the subject, by A. C. SMEATON, civil Engineer."

This work will be found highly useful especially to young builders, as it describes and illustrates by engravings, the various modes of building. There are over 75 engravings. By the following "contents" our readers will perceive the character of the work. It will be completed in the six ensuing numbers.

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INTRODUCTION.

So intimately is the art of building connected with a provision for the comforts and conveniences of life, that it has engaged the attention of men from that period when they first formed themselves into societies. In the early ages of the world, little more could have been required than a temporary shelter from occasional atmospheric changes, and houses or huts were probably constructed in a very rude and imperfect manner; but as even communities were not then accustomed to confine themselves to any locality, such residences were sufficient for their purposes. But when large societies determined to occupy a place as a constant residence, they surrounded themselves with all those permanent comforts which might be within their reach. The art of building necessarily attracted much of their attention, and nations vied with each other in an attempt to blend stability of structure and elegance of appearance. These are the objects of builders in the present day, but at the same time, the altered state of society requires that they should be equally careful to secure economy in the use of the materials, that no unnecessary expense may be incurred by their waste or misapplication, or by the addition of unnecessary labor.

The importance of the subject has induced men to acquaint themselves with the general principles of construction, and the application of ornament; and to give their attention to individual branches of the science and art of building, so as to obtain by the combined labors of many some knowledge of the whole. Many expensive and useful books have been published, by both architects and builders, upon different subjects connected with the art and science of building; but many of these books are not only too costly for the means of some persons desirous of knowledge, but would be almost useless if they could be obtained. A preliminary knowledge is required before the student can either perceive the importance of the information they contain, or the means by which it may be applied. There are it is true, many introductory books, but they chiefly treat of Architecture and Designing, and are of little assistance to the workman or the student.

In preparing this manual the author has endeavored to supply the reader with such important elementary knowledge as shall enable him to understand the general principles of building, and fit him for the perusal of those works which have been written on several subjects connected with the art. There are three classes of men engaged in the completion of a building, the architect, the builder, and the surveyor; and each should be perfectly acquainted with the business of the others. Some persons have professed the three arts, a practice which cannot be too strongly condemned, since it is impossible that any man can give sufficient attention to all, to do either correctly or well. But at the same time an acquaintance with all is desirable, for they are so closely connected, that one cannot be properly practised without the assistance of the others.

The business of the Architect is to design buildings, to make such drawings, and to so describe them as shall enable the builder to execute that which he has planned. The surveyor masures the work when finished, and affixes appropriate prices according to his judgment of the manner in which the workman has performed his task, and the difficulties which have attended the execution. An elementary work on Building should describe the manner in which these persons severally perform their tasks, and we have therefore divided our book into three parts or sections, which we have designated the Builder, the Surveyor, and the Architect.

THE

BUILDER'S MANUAL.

THE BUILDER.

WRITERS on Architecture have frequently divided the art into three parts, because in the erection of a building three things are required, *strength*, *convenience* and *beauty*.

In order to obtain strength, good materials must be employed, and they must be well applied. There must be a proper arrangement of the several portions of edifices, so that instead of weighing down or oppressing each other, they may mutually strengthen each other; and should faults be suspected to exist, in either the quality or dimensions of the materials used, they must be employed where they would be sufficient for the purpose, should the suspicion be realized. The builder must also be careful that any stress may be met by a suitable arrangement of parts, and that the strength may be in a reciprocal proportion to the stress which is to be overcome.

To provide convenience, the building must be suited to the purpose for which it is intended. The rooms, for instance, should be of a size proportionate to the use for which they are to be employed, or the business that is to be done in them; a small house should not be encumbered and lessened with a large staircase, nor a large mansion be rendered uncomfortable by one that is cramped in its dimensions. "The hall," as Fuller says, "ought to lie open, and so ought galleries and stairs, provided the whole house be not spent in patns. Chambers and closets ought to be private and retired." Every part should be suited to the purpose for which it is to be used.

The beauty of a building does not altogether depend upon its architectural decorations and ornaments; but there must be a just proportion of all its parts, the width, length, and height, being everywhere so adjusted as to produce that harmony calculated to give pleasure to the observer. Many persons err in overloading an edifice with

ornament, while others impair the general appearance by neglecting altogether its enrichment. There should never be introduced an ornament that has the appearance of supporting a weight where there is evidently no weight to support; and when mouldings are employed, they should have an agreement with the dimensions of the walls on which they are to be fixed, being neither heavy in small apartments, nor diminutive in large ones.

The first thing to be done when a building is to be erected, is to survey the ground on which it is to be placed, with a view to determine the nature of the soil, whether it be rocky, swampy, or composed of clay, gravel, or sand. When this has been determined the foundations may be arranged for, and the operations required must be regulated accordingly.

The dimensions must then be set out, as shown upon the plan of the basement. This is best done by first marking out the line of the principal front, and then placing stumps, or pins, at those parts where the side and internal walls meet it. When the several angles have been determined, and the line of walls marked out, the excavator may proceed to form the trenches which are to receive the footings, or foundations; and the work is then regularly proceeded with, according to the drawings which are placed in the workman's hands. And here it may be necessary to remark, that architects generally form their drawings from a scale of one eighth of an inch to a foot; but this is not adopted in every case; and, therefore, to prevent mistake, the plans and elevations are generally figured. The scale of one inch to a foot is the most convenient for workmen, for they have then only to apply their rule to the several parts of the drawing, and, calculating every inch as a foot, it is scarcely possible for them to make a mistake. But it is not always practicable to draw a plan to this scale, as it would in some instances extend the drawing to an inconvenient size.

These general remarks may be of some service to the beginner, as illustrating the objects to be obtained in building, and the manner in which the workman is to commence his operations. We may now proceed to make some more particular remarks upon the several departments of building, the nature and composition of the materials employed in each, and the methods by which they are worked. As this little volume is intended for the use of the student in all departments, we shall not consider any fact, however self evident it may appear, too simple to be mentioned; but we shall endeavor to lead him on, by easy steps, from the simple to the more complex principles of the art, giving so much of the science as may appear necessary to afford a reason for the process that may be adopted.

THE BRICKLAYER.

As the art of bricklaying is generally supposed to be so simple as to require little or no attention, it will be necessary to remove this false impression by a somewhat particular detail of the facts which relate to it. There are many persons, and even some workmen, who suppose that nothing more is required than that the bricks should be properly bedded, and the work level and perpendicular. But the workman who would attain perfection in his business, should acquaint himself with the different arrangements made use of in placing the bricks, so that one part of the work shall strengthen another, and thus prevent one portion from a greater liability to give way than another. It is also necessary that the workman should be acquainted with the several sorts of bricks, their qualities, and the uses for which they are particularly adapted.

It appears from history that bricks have been employed for building from a very early period. We are informed by the sacred records, that very shortly after the occurrence of that universal catastrophe, which swept from the earth nearly the whole human race, and remodelled its surface, the sons of Noah fixed their abode in a plain in the land of Shina or Chaldea, "and they said one to another, go to, let us make brick, and burn them thoroughly. And they had brick for stone, and lime had they for mortar." By the same authority we are informed that the Jews during their servitude to the Egyptians, were employed not only in making bricks, but also in building with them. "And they (the Egyptians) made their life bitter with hard bondage, in mortar, and in brick."—"And they built for Pharoah treasure cities, Pithom and Raamses." Nearly all the Egyptian buildings spared by the devastating hand of time, are constructed of stone, but there are some brick buildings still in existence, and Pocock mentions a pyramid constructed of unburnt brick.

From all the evidence we can collect on the subject, except that to which we have referred, it does not appear that the Egyptians, or any other of the early inhabitants of the earth, were acquainted with the art of burning bricks; but both the Greeks and Romans used them. Vitruvius has given a description of the kind of bricks used in his own day, and has offered some suggestions as to the choice of the material from which they ought to be formed. The passage is interesting, as and the works of this author may not be in the possession of all our readers, we may be permitted to quote it from Mr. Guilt's translation. "They should be made of earth of a red or white chalky, or a strong sandy, nature. These sorts of earth are ductile and cohesive, and not being heavy, bricks made of them are more easily handled in carrying up the work. The proper season for brick-making are the spring and autumn, because they then dry more equally. Those made in the summer soltice are defective, because the heat of the sun soon imparts to their external surfaces an appearance of sufficient dryness, whilst the internal parts of them are in a very different state; hence when thoroughly dry, they shrink and break those parts which were dry in the first instance; and thus broken, their strength is gone. When plastering is laid and set hard on bricks which are not perfectly dry, the bricks which will naturally shrink, and consequently occupy a less space than the plastering, will thus leave the latter to stand of itself. It is not therefore, without reason that the inhabitants of Utica allow no bricks to be used in their buildings, which are not at least five years old, and also approved by a magistrate.

"There are three sorts of bricks, the first is that which the Greeks call Didoron, being the sort we use, that is, one foot long, and half a foot wide. The two other sorts are used in Grecian buildings; one is called Pentadoron, the other Tetradoron. By the word Doron, the Greeks mean a palm. That sort which is five palms each way is called Pentradon; that of four palms, Tetradoron. The former of these two sorts is used in public buildings, the latter in private. Each sort has half bricks made to suit it, so that when a wall is executed, the course on one of the faces of the wall shows sides of whole bricks, the other face of half bricks, and being worked to the line on each face, bricks on each bed bend alternately over the course below."

There has been some dispute among antiquaries as to the time when bricks were first introduced into England. Dr. Lyttleton states in Archæologia, that there were no brick buildings earlier than the fourteenth century. Bagford says they were introduced in the reign of Henry the Seventh, but it must have been earlier than this, for Ewelme palace in Oxfordshire, erected by William de la Pole, and Herstmonceaux castle in Sussex, were both erected in the reign of Henry the Sixth. But we leave the antiquaries to determine this disputed question, and proceed to make a few remarks of a more practical character.

Bricks.

Brick is an artificial stone, formed of clay moulded in rectangular prisms of constant dimensions, and hardened by burning, or exposure to the sun. All bricks made in England must be, according to act of parliament, nine inches long, four and half inches broad, and two and a half thick.

There are several kinds of bricks; the most important to be mentioned are marls, stocks, and place bricks. All these are formed in moulds of the same size, and differ only in quality, which depends upon the character of the clay, the care taken in tempering it, and the manner in which it is burnt. The best marls are called firsts, and are used for the heads of doors and windows; the seconds are used for facing, that is, for the front of a building; and for this purpose they are admirably adapted, not only on account of their color, which is a yellowish white, but also for their compactness, and capability of resisting the action of the atmosphere. Grey stocks are sometimes used instead of marls, but they are of inferior quality. Place bricks are the refuse of a burning, and are in fact these which have not been perfectly burnt. Clinkers are overburnt bricks.

For paving, Dutch clinkers, so called because imported from Holland, are frequently used; they are very hard, and have a light yellow color. These bricks are six inches long, three inches broad, and are laid herring-bone way.

Tiles.

There are several sorts of tiles. Paving-tites, used for kitchens and dairies in farmhouses, are about nine inches long, four and a half broad, and one and a half thick. Roofing-tiles are formed in different

ways, and are known as pan-tiles, plain-tiles, hip-tiles, and ridge-tiles.

Pan, or Flemish-tiles, are fourteen inches and a half long, and ten and a half broad. It is seldom that these tiles are used, even in country towns, for any other purpose than that of covering sheds and out-houses; and, as they have no pin-holes, they are altogether unfit for a high-pitched roof.

The size of plain-tiles is regulated by law, and they should be ten inches and a half long, six and a quarter broad, and five eighths of an inch thick. They are hung on the laths by oak pins, there being two holes in each tile.

Ridge and hip-tiles are of a semi-cylindrical form, and are thirteen inches long, and sixteen inches girt on the exterior surface.

Brick-making.

Brick should be made of an earthy loam; but the manufacturer is not generally very careful as to the earth he uses, so that it be only possible to make an article which he can sell, or employ himself. Hence it is that some bricks are very brittle, because there is too large a quantity of sand; and others are shaky, because they contain too little, and crack in the drying. It is absolutely necessary for the manufacture of a good brick, that the earth of which it is to be formed, should be exposed to the air, and especially to the frosts of winter, at least during one year, that it may be pulverized, as this will aid the tempering; and the more it is turned over, during the time of its exposure, the better will be the brick.

An experiment, made by M. Gallon, fully proves the necessity of well tempering the earth to be employed in brick-making, "He took a certain quantity of the earth prepared for the making of bricks, he let it remain for seven hours, then caused it to be moistened and beaten during the space of thirty minutes; the next morning the same operation was repeated, and the earth was beaten for thirty minutes; in the afternoon it was beaten for fifteen minutes." After moulding a brick, made of this earth, he found that it weighed five pounds eleven ounces, but one made of the same earth without the same preparation, weighed five pounds seven ounces. When the bricks were dried and burnt, he tested their strength, and found that under the same circumstances, the brick made of well-tempered clay broke with a weight of one hundred and thirty pounds, while the other broke with a weight of seventy pounds. This result clearly proves the necessity of well-tempering the brick earth, which is usually done by a mill, put into motion by horses.

When the clay is prepared, it is pressed into a mould ten inches in length, and five in breadth; but the brick itself, when burnt, is not more than nine inches long, and five and a half broad, on account of the contraction it suffers by exposure to heat, driving off the water which is in combination with the clay. When the bricks are turned from the mould, which is readily done, the mould being strewed with sand to prevent the adhesion of the clay, they are placed in hacks in a diagonal position, so as to admit the air. Each hack is two bricks wide, and eight bricks, on edge, high. To prevent the access of rain, long sheds are sometimes erected, and the hacks are formed under them; but at other times they are covered with wheat or rye straw. The time required to dry the bricks must depend upon the weather; if favorable, it may be done in six or eight days.

Bricks are burnt either in clamps or kilns; the former are generally used, but the latter are preferable.

Clamps are made with the bricks to be burnt. The foundation is made with place bricks, and of an oblong form. The flue is first formed, passing through the clamp, and about a brick wide. Between each course of brick, a layer of cinders or breeze is placed, the bricks being placed diagonally about an inch apart on each side of the flue. When the clamp is about six feet high, a second flue is made similar to the other, that is to say, if the bricks are immediately required, if not, the flues may be placed about nine feet apart; each flue being filled with coal, breeze, and wood, closely pressed. A layer of breeze is always laid at the top of the whole. The fireplaces are usually placed on the western side of the clamp. The bricks may, if required, be burnt in twenty or thirty days, the time varying according to external circumstances. The outside of the clamp is sometimes plastered with clay when the weather is precarious.

Kilns are frequently used for burning bricks, but more commonly in the country than in the neighborhood of London.—They are to be preferred to clamps, as they require less fuel, and less time is required in the process. The walls of a kiln incline inwards, and are usually a brick and a half thick. A kiln is about thirteen feet long, ten feet wide, and twelve feet high, and will burn about twenty thousand bricks at the same time. The bricks are laid upon an open floor, and after they have been thoroughly dried by a gentle fire, a pile of brick, closed with wet earth, is placed before the fireplace, space being left to add faggots as may be required. When the arches have a white heat, and fire appears at the top the heat is slackened, and then increased, until the bricks are thoroughly burnt, which is generally in about two days. The workman can always determine whether the bricks are dried or not, by the color of the smoke, which turns from a darkish to a transparent color, as soon as this has been accomplished; the burning is then commenced.

The advantages which result from a division of labor are well known, and they are not more evident in any mechanical employment, than in the manufacture of bricks. In a long day, that is to say, between five in the morning, and eight at night, a good moulder, will produce five thousand bricks.

There is a very judicious remark in Mr. Partington's Builder's Complete Guide, but we are at a loss to say whether we are indebted to him, or to Mr. Malcolm for it; we have quoted it as it stands in the work we have named. "The color of London bricks is not red, as is the case with the common bricks and tiles, but of a light brownish yellow. This color is more pleasing to the eye, than that of the common red brick, and on this account the London bricks are preferred for building houses. The brick-masters assign a curious reason for this color. According to them, their bricks are kept as much as possible from the contact of the air during the burning. The consequence of this is, that the iron contained in them is not oxidized to so great a degree as in common bricks; but this mode of reasoning is far from exact. If air were entirely excluded, the bricks would not be burnt at all; because the fire would be extinguished. But if enough air be admitted to burn the coal, mixed with the clay, (which must be the case,) that air must also act upon the iron, and reduce it to the state of a peroxide; indeed there can be no doubt, but, that the iron in the London yellow bricks is in the state of a peroxide, as well as in the red bricks; for the peroxide of iron gives various colors to bodies according to circumstances. With it, we find bodies tinged, red, yellow, and brown, according to the substances with which the oxide is combined. We ascribe the color of the London bricks to the ashes of the coals, which, by uniting with the peroxides of iron, form a kind of yellow ochre."

A patent was sometime since taken out by Mr. Shaw for the manufacture of bricks. This gentleman proposed a very ingenious arrangement, by which the clay could not only be pressed into the mould, without manual labor, but be also removed by machinery. The machinery may be moved by any mechanical power, whether it be manual, steam, or horse.

CEMENTS.

Having explained the manner in which bricks are made, and the means of distinguishing their qualities, it will be necessary to state the composition of the several kinds of cement, that are used in order to bind or connect the several parts together; and it may here be necessary to mention, that we shall not confine our remarks to those cements which may be used by the bricklayer, but shall also refer to those which may be commonly employed by the mason; for as we must speak of the origin of the cementitious principle, it seems desirable to explain all the several kinds of substances, in the composition of which this principle is called into action. But before we speak of the cements themselves, it will be necessary to refer to the nature of that substance, lime, which is their principal ingredient.

Lime.

Lime is easily distinguished from other substances by its properties. It is an earth having a white color, and produces a caustic sensation upon the tongue; is incapable of fusion by ordinary temperatures, being one of the most infusible substances in nature, and is but little soluble in water, though it is more soluble in cold than in hot water. Lime is seldom, if ever, found pure in nature, but is generally in com i-

nation with an acid; most frequently with carbonic acid, as in the formation of chalk, limestone, and marble. Lime is a very abundant ingredient in the composition of the earth's crust, and generally makes its appearance as a carbonate, but both sulphates and carbonates of lime are found to occur as constituent parts of mineral substances. To obtain pure lime, that is, lime separated from an acid, with which it is uniformly combined in nature, the mineral must be submitted to a red heat, which drives off the acid, and leaves the lime in a state of purity; it is then called caustic or quicklime. Chalk, limestone, marble, oyster-shells, and other substances, are carbonates of lime; and either of these will, when burnt, furnish the material required in building; but the two former are chiefly used for this purpose.

Builders are well aware of the fact, that all limestones or mineral substances containing lime, as an ingredient, do not possess the same cementitious properties.—One stone may yield, when burnt, a lime very superior to another, and this difference depends upon the quantity and character of the advantitious substances, which are combined with the lime. Many of these may be detected by the appearance of the mineral, or by very simple experiments.—When the limestone has a deep brown or red color, it generally contains iron, and when burnt has a yellowish hue; when it does not freely effervesce with the application of an acid, and is sufficiently hard to scratch glass, it contains silex; when it effervesces slowly, and gives a milky appearance to the acid, it contains magnesia. The effects of these and other substances upon cements, have not been accurately determined.

The cementing quality of lime seems to arise from its chemical combination with the substances with which it is mixed.—First of all it unites with a certain proportion of water, forming a hydrate of lime, which appears to have a chemieal attraction for silica, that is to say, the sand with which it is mixed. After exposure to the atmosphere for a short time, it abstracts and applies a portion of carbonic acid, which greatly increases its hardness, and on this account all old mortars are remarkable for their cohesion and strength, frequently becoming stronger than the stones they unite. Sir Humphrey Davy, speaking of cement, says, "The cements which act by combining with carbonic acid, or the common mortars, are made by mixing together slaked lime and sand. These mortars at first solidify as hydrates, and are slowly converted into carbonate of lime, by the action of the carbonic acid of the air. Mr. Tennant found that a mortar of this kind in three years and a quarter, had regained 63 per cent. of the quantity of carbonic acid which constitutes the definite proportion in carbonate of lime." But there are two kinds of cement used in building: that in which lime forms a prominent combination with water, and this is called a water cement; and that which combines with carbonic acid, which is called a mortar: this distinction is a very important one; one kind has the property of setting under water, the other has not.

Sand.

Sand is a very important ingredient in cements, and too much pains cannot be taken to obtain it pure. River sand should be always preferred to pit sand, for it is less likely to be mixed with clayey or other substances, which greatly injure the indurating property of the cement. But wherever the sand may be obtained, it should be well washed, and this is especially nenessary if taken from the sea; for the salt with which it is combined, having strong hygrometric properties, would prevent the cement from drying. This effect we remember to have frequently observed in a little seaport town, where beach-sand had been used by the builders, without sufficient washing.

Mortar.

Mortar is made of lime and sand, thoroughly mixed together, and brought into the consistency of a paste, by the addition of water. Different proportions of these substances are used by builders, and this must necessarily be the case, for a larger or smaller quantity of sand must be added in proportion to the quality of the lime. A good lime will take more sand than a bad one, and the value of the cement may, in a great measure, be judged of by the quantity of sand it contains. Builders are accustomed, for instance, to use more sand with stone-lime than with chalk-lime; not that there is in general much difference between the two, when first burnt, but because the quality of the chalk-lime is speedily injured by a very rapid absorption of carbonic acid. With one hundred and fifty pecks, that is, thirty-seven and a half striked bushels of chalk-lime, the workman mixes two loads of sand, each load consisting of thirty striked bushels; but twenty bushels of stone-lime will frequently bear two loads and a half of sand. It is estimated that the mortar produced by either of these proportions, will do a rod of brickwork, that is, two hundred and seventy two and a quarter square feet, superficial measure, a brick and a half thick, that is, about fourteen inches. According to the experiments of Dr. Higgins, a proportion of one peck of lime to seven of sand, makes the best mortar.

When mortar is to be used in a situation where it will dry quickly, it should be made with as little water as possible, but it is better that the mortar should dry gradually and slowly, as it then becomes more indurated. It is stated by some writers that mortar is injured by keeping, and under one condition, exposure to the air, it is; but, if excluded from the air, it is rather benefited than injured. Pliny states, that the Roman builders were prohibited by law from using a mortar that was less than three years old; and attributes the stability of all their large buildings to this circumstance. But when old mortar is used, it should be well beaten up before it is employed. The reader must not, however, suppose that these remarks justify the exposure of mortar to the air for a considerable time before it is used, a practice very common, but highly improper. This practice probably arose from the difficulty which workmen sometimes find in slaking the lime, in consquence of its being insufficiently burnt, or containing a large portion of argilaceous matter. But of all other things, it is important to use good lime, and to soak the bricks which are to be bedded, before they are laid; for, if the bricks are dry, they imbibe the moisture of the cement, and destroy its quality. There are two things which cause mortar and cements generally to crack, too small a quantity of sand and a too rapid exhalation of the water. There must always be a contraction, but it is least in those mortars which contain the greatest proportion of sand; for it is the moistened lime which contracts during the process of drying. All mortars may, for a time, be affected by atmospheric changes, and especially by alternate wetting and freezing; but this is the most remarkable in those which are liable to crack. A mortar which sets without cracking will always stand afterwards.

Dr. Higgins, to whom we are much indebted for his experiments upon cements, invented one which he speaks of as admirably adapted for both internal and external work; and becomes as hard as Portland stone when dry. "Take," he says, "fifty-six pounds of coarse sand, and forty-two pounds of fine sand; mix them on a large plank of hard wood, placed horizontally; then spread the sand so that it may stand at the height of six inches, with a flat surface, on the plank; wet it with the cementing liquor; to the wetted sand add fourteen pounds of the purified lime, in several successive portions, mixing and beating them together; then add fourteen pounds of bone-ash in successive portions, mixing and beating all together." Whatever may be the quality of this cement, it is not likely ever to come into general use, as it would be more expensive, and give more trouble in preparation, than many others which are now found to answer the builder's purpose. This, however, was proposed as a water-cement. Mortar is evidently unfit to be used in any situation where the force of water is to be resisted; for although it is said that mortar composed of lime and sand, in the proportion of one and seven, will not suffer from water, yet, as this composition is seldom, if ever, obtained, it would be folly to risk the security of a building by its use.

The insufficiency of mortar for all those works, the whole or part of which are under the water, induced the scientific builder and chemists to seek a substitute. Many compositions have been recommended, and several of them have been found to answer the purpose. There is one substance, however, Roman cement, which, above all others, is extremely useful for a number of purposes, and will require our attention; and if our remarks should occupy a space which may appear to have no proportion to the length of the other parts of the volume, the importance of the subject will be a sufficient excuse.

Roman Cement.

Roman cement was accidentally discovered in the year 1796, by Mr. Parker, whose attention was attracted, when walking beneath the cliffs of blue clay, on the shores of the island of Sheppy, by the uniform appearance of the masses of stone which were strewed here and there upon the beach, and were seen projecting from the cliffs. As a mere matter of curiosity, he collected two or three fragments, and happened afterwards to throw one of these pieces in the fire. After it had been exposed for some time to the fire, it fell upon the hearth, and was there found by Mr. Parker, who was induced to make some experiments upon its cohesive properties, which led him to the discovery of its value, as a strong and durable cement. He then immediately applied to the Government of the day, for a patent, which was granted to him for fourteen years; and having secured to himself the right of manufacture, realized an ample fortune.

So great has been the recent demand for cement stone, that its quantity has been much diminished, and other substances have been substituted to so great an extent, that the cement now used is much inferior to that originally manufactured by Mr. Parker.—So small is the quantity obtained on the Sheppy coast, that the manufacturer is scarcely repaid for the cost of a search. The natural physical causes which are constantly active, have a tendency to increase the quantity upon the beach which surrounds this interesting island; but all natural agents act in a slow and progressive manner, so as to afford a very inadequate supply for the demand which is now made for this material. The masses once abundantly strewed over the shores of the island of Sheppy have been long since removed by the cement manufacturers, and the supply which is now obtained from this spot depends upon the quantity of the cliff that may be thrown down by the undermining influence of land-springs, or by other cause. At the base of the cliffs which surrounds this island may be seen, here and there, extensive land springs, which weaken the foundation of the clay, and frequently cause masses of large extent to fall upon the beach. This cause is aided by the storms which, during the winter season, frequently blow upon its shore, and, either by the force of the waves or by the subsequent drying of the saturated mass of clay, weakens its cohesion, and produces the same effect. The falling of the cliffs produced by these and other means, furnishes a small quantity of cement stone, but a quantity altogether inadequate for the supply of the demand. But as far as observation extends, it appears that these nodular stones are found in all the deposits of London or blue clay. This stratum is found in Harwich, and other places, as well as at Sheppy; and the attention of the manufacturer was consequently directed to them, for a supply of the material. But it has been stated, and experiment seems to justify the assertion, that the Sheppy stone yields a much better cement than that which is obtained from other places: the cause cannot be readily determined; but so great a value is placed upon the former, that some persons have actually excavated for the purpose of obtaining it. But the principal part of that now used by manufacturers is obtained from Harwich; and not less than from thirty to forty tons weight are annually collected in this place. The engineer and architect still prefer the Sheppy cement, which has a much lighter color than that made from the Harwich stone, but is far more expensive. The manufacturer, however, now so frequently intermixes other ingredients with the Harwich cement, to give it the same appearance as the Sheppy, that it is almost impossible to determine the quality by the color. Limestones, found in other places, have been substituted for the Sheppy nodules; all of which, excepting that which is found in small quantities in the marshes of Essex, near Steeple, are much inferior to it.

The manufacture of cement is extremely simple, although some experience is necessary, as the character of the cement will depend as much upon the manner in which it is made, as upon the property of the stone. After the stone has been broken into small pieces it is thrown into a kiln, with a proportion of small coal, to be burnt. A strong red heat must now be supported throughout, and considerable skill, or rather experience, is required to accomplish this purpose, for the relative degrees of hardness in the several pieces, and other causes, tend to give them an unequal temperature and to prevent perfect calcination. After the stone has remained from thirty to forty hours in the kiln, in which time it is usually perfectly burnt, it is taken to the mill, and being immediately ground to powder is packed in casks and sent into market. Promptness in all the processes which follow burning is absolutely necessary, for the contact of the air impairs the adhesive power of the cement. Hence it is that builders who study the character of their materials invariably prefer the cement which is made in large manufactories; a ready sale generally securing, them from the use of an old cement. Good cement perfectly burnt has a light-brown color, and has very little weight; but if imperfectly burnt it is heavy and has a dark color: when the stone is burnt overmuch, small black carbonized particles may be observed. It may be necessary to state that the cement should always be reduced to as fine a powder as possible; and to accomplish this an attempt was made some time since to sift it, but its exposure to the air was found to injure its properties as cement. As a test to the value of a cement the experimenter may mix with it a quantity equal to two-thirds of clean, well washed, and dried sand, and should it then have a strong cohesive power he may depend upon its qualities; but as soon as the two ingredients are mixed and moistened, the cement should be used, or it will either fail to set or to possess an adequate adhesive power. These suggestions, if carried out, will be found of great importance in the art of building, and particularly in those instances where great stability is required. The builder frequently attributes to the cement that which depends upon its own injudicious use or exposure of the material; and even bad cement may be made tolerably effective for ordinary purposes, if it be little exposed to the atmosphere, and be used immediately after its mixture.

Roman cement should never be used in any situation where there is the slighest chance of warping or spring, for as it does not possess any elastic force it is sure to break way. For covering walls when used as a stucco it is well suited, but the bricks should be damped previous to its application, or they will absorb its moisture and give it a porous structure. But stucco will not bind upon a bed of stucco, and it is therefore necessary that it should be applied in one coat; for, as good cement will set in about twenty minutes, a second bed cannot be applied at any subsequent period without endangering the stability of the work, for one coat is almost sure to separate from the other.

To ascertain the relative value of any number of cements, mix them with certain proportions of sand, and that which is the hardest with the largest proportion is the best. As a collateral proof the specimens may be kept for a few days, and it will be found that a quantity of bloom formed upon their surfaces will have some relation to their qualities. Good cement, will always be raised to a great temperature when mixed, and those which are not may be considered worthless. There are some cements that harden very quickly, and yet are of very bad quality, and will in the course of a few hours become quite soft. These facts are well worthy the attention of the workman or the builder, for they will not only enable him to ascertain which is a good and which a bad material, but also to use the material he may choose, in the most advantageous manner.

Chemists and others who have investigated the properties of hydraulic limes are not by any means agreed as to the cause of the cementitious quality. Saussure was of opinion that their peculiar properties were derived, from the presence of silex and alumina in certain proportions; Descotils attributes them to the presence of a large proportion of silex, and Bergman and Guyton to a small proportion of manganese.

The Roman is the most valuable of all water-cements, as well for the ease with which it may be used, as its hardness and durability. As it sets in about fifteen minutes, the workman cannot mix more than a small quantity at once. Experience will soon teach how much can be worked in a certain time: an appropriate quantity must be taken upon a clean board and something more than an equal quantity of very clean and dry river sand. When the lime and sand are thoroughly mixed, as much clean water as is necessary to form them into a paste should be added. The workman should then immediately use it, and after it has been once applied, it should not be in any way disturbed. Forty bushels of cement, with its apropriate quantity of sand, will do a rod of brick-work. Good cement will take two parts of sand, and that cannot be called good which will not take one and a half.

When cement is used for coating or lining walls it must have as much sand as possible, so as not be too stiff to work. It must also be always worked in one coat, and the surface to which it is applied should be clean and well wetted. Cement when thus used is called stucco, and should be laid on three-quarters of an inch in thickness. A bushel of cement with its proper proportion of sand will cover a surface of two square yards.

Cement is also used for casting ornaments, for which purpose it answers exceedingly well. Gothic work is sometimes finished in this way, but, although it may be desirable in some instances, it is generally better to use stone where very ornamented work is to be introduced.

There are several other kinds of cement which are occasionally employed by the bricklayer, but they are not of sufficient importance to be treated of in a work which can only give some of the most prominent facts in the art of building. But it may be asked, what was used before Parker's cement was discovered? This question leads us to make a few remarks upon two cements which were once extensively used in this country, Puzzolana and Tarras, but are now scarcely ever employed.

Puzzolana.

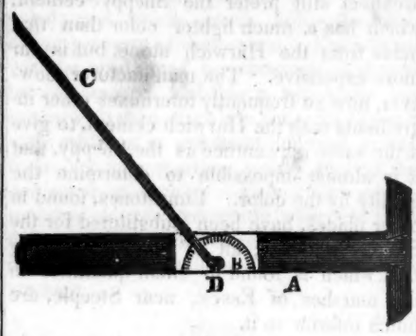
Puzzolana is a volcanic substance, consisting, according to Bergman's analysis, of from fifty-five to sixty per cent. of silica, from nineteen to twenty of alumina, five of lime, and twenty of iron. The Romans were accustomed to mix this substance with lime in the manufacture of water-cements, and the same method was a long time adopted in England. The hardening of the mortar is supposed to arise from the union of the oxygen of the water with the iron.

Tarras.

Tarras or Tras is a substance found at Andernach, in the department of the Rhine, and, according to Bergman, differs but little from Puzzolana in composition. Tarras mortar is well suited for all those situations in which it is constantly exposed to water, but it cannot resist the action of alternate wet and dry, and indeed is never so firm when it sets in exposure to air as under the water. The principal objection to the use of this mortar was its expense, and consequently the Dutch attempted to supply its place by the union of substances found in their own country, and succeeded so well that a large quantity was imported into this country, and extensively used. There are two proportions which have been adopted as the best for Tarras mortar: in one kind a measure of quick lime is mixed with a measure of Tarras, and being thoroughly mixed are brought into the consistence of paste by the addition of water, as little water being used as possible; in the other, one measure of Tarras is mixed with two measures of slaked lime and three of sand,—this is almost as good a cement and much cheaper than the former.

From the Mechanics' Magazine.

Sir,—I send you an improvement of Dr. Farishes Isometrical drafting square, as published in Brantons Machanics', page 209; should you think it worthy your attention you will please give it place in your valuable Magazine, that it may benefit some who are making use of his perspective.



In the first place take a common drafting square A, with the blade something wider than usual, and (instead of his notched ruler so made as to form an angle of 60°, which he says is the most common angle,) put a piece of Brass B, so fitted as to slide from end to end. On that strike a semi-circle, graduato it into 180°, numbered from the base upwards to 90°; then by another small ruler C, turning on the point D, in the centre of the circle and one side running directly to it; it will readily be seen that we may draw a line to any angle by taking the degrees on the circle instead of being confined to one, as in his plan. I made one, only temporary, but am satisfied that it may be made so as to be a great improvement in Isometrical Perspective. H. B.

Agriculture, &c.

From the New-England Farmer.

Providence, Feb. 11, 1837.

Mr. T. G. Fessenden,

Sir,—I perceive that you seem to recommend the use of Potatoes in making Bread. It is I presume, for economy, for no person would use them for any other purpose, in preference to flour. It should not be forgotten that 10 oz. of flour will, with a little yeast, and a due quantity of water, make 15 oz of bread, and that water is cheaper than even potatoes. If the bread be so made as that the moisture of the potatoes supplies the place of water, in the production of dough, you will lose all the bread, which would have been produced by the use of water. I have known potato bread made with a total loss of the potatoes, and yet heard a great boasting of the economy of the proceeding.

Will the black corn produce as much as the blue or white, if planted, both of them as they should be, three feet by 15 foot? Its earlier maturity is in its favor, but not so much as the loss of one-fourth of the crop; for in New-England the corn is not injured by frost one year in four, or perhaps eight.

Mr. Bateman, of Newport, in this State, has raised, as I am told, 1600 bushels of Mangel Wurtzel on an acre; he uses them in fattening cattle. This crop requires the whole season, while the Ruta Baga may be raised to, perhaps, three-fourths of that amount after a crop of grass, or any kind of grain. The difference in the nutritive qualities of roots should be considered, and the purposes for which they are fed.

With high respect, I am
Your obedient servant,
Tristram Burgess.

By the Editor.—We are ever happy to receive articles like the above, from gentlemen, whose character, mental powers, and standing in the community are calculated to turn the attention of the reading and thinking part of mankind to the pursuits of economy. With regard to converting water into nutritious matter, and making it food for animals as well as plants, we have heretofore made some remarks in a note to the Boston edition of Mowbray's Treatise on Poultry and in the New-England Farmer, vol. x, p. 389. We will now take the liberty to repeat some of those observations, as they are pertinent to one of the topics of our able correspondent's communication, and will perhaps be new and useful to some of our readers:

"It is a fact, which will be acknowledged as soon as stated, that a pound of Indian meal, or rice, or any other farinaceous substance, when boiled, contains more nourishment than several pounds in a raw state. Count Rumford has stated, "from the results of actual experiment, it appears that for *each pound* of Indian meal employed in making a pudding, we may reckon *three lbs. nine ounces* of the pudding.* And again, three pounds of Indian meal, three quarters of a pound of molasses, and one ounce of salt, (in all 3 pounds 13 ounces of solid food,) having been mixed with five pints of boiling water, and boiled six hours, produced a pudding, which weighed *ten lbs. one ounce.*† Thus we gain from the raw material more than 300 per cent. in weight, and, no doubt, the gain as respects the quantity of nutriment contained in the pudding, over and above the component parts as they existed before boiling was still greater. The gain of weight in rice, in consequence of boiling, is more considerable than that of Indian meal, and every one knows that a small quantity of oat-meal will produce a very great relative proportion of gruel."

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* Count Rumford's Essays, vol. 1. p. 258.—Boston edition.

† According to Sir Humphrey Davy's Table of the Quantities of Soluble or Nutritive Matters afforded by different vegetable substances, 1000 parts of wheat afford 995, whole quantity of soluble or nutritive matter, 765 of mucilage or starch, 190 of gluten or albumen. Potatoes afford by analysis, the same materials, but in a smaller proportion and the addition of saccharine matter, viz: from 1000 parts, from 260 to 200, whole quantity of soluble matter, from 200 to 155 mucilage, or starch,

from 20 to 15 saccharine matter, from 40 to 30 gluten. As wheat and potatoes both contain mostly the same constituent parts, one would suppose there could be no loss by their mixture in bread; but there are properties belonging to the potato part of the mixture, which do not belong to that which is composed of the flour. The potatoes are cooked and boiled before they are mixed with the flour or dough, while the flour is a raw material, and potatoes, we believe, are not increased in bulk or substance, by any process in cooking, like flour, Indian meal, or rice, &c. This subject, however, deserves further investigation, and our able correspondent, by resuming it, would oblige us, and probably benefit the public.

From the Practical Farmer.

MORUS MULTICAULIS.

Sir,—Having seen many statements and suggestions in public prints, that the Chinese mulberry, (morus multicaulis,) was not as hardy as the White mulberry, and that it would not bear the extreme cold of our winters, &c., I deem it proper to state my own observation on the subject. I was the first person south of New-York, who had the Morus Multicaulis; it was sent to me by my old friends, Wm. Prince and Sons, in 1828, in a collection of seven other varieties of mulberry. It was not then known by the present name, but it was called the Phillipine Island mulberry, and I believe was received by the Messrs Prince direct from those Islands. About a year after I received it, accounts were received from France of the receipt there of the Morus Multicaulis, and of its great value for feeding worms. On examining my trees, I at once found that my Phillipine Island Mulberry was the Multicaulis, and immediately commenced feeding my Silk worms with it; and from experiment, ascertained the truth of all the French had said about it. From that time to this, I have continued to urge upon all, the propriety of cultivating this, in preference to the white mulberry. Its advantages are, it is full as hardy as the white; one pound of its leaves contain as much nutritive matter as a pound and a half of the white; the silk made from it is of a finer texture and more lustrous; its leaves are so large that a pound can be gathered at half the expense and trouble that a pound of White Mulberry leaves require; it can be cultivated with infinitely more despatch than any other kind. These are all great advantages, and I am so well convinced of the correctness of this statement, that I do not hesitate to say, that within ten years, no other mulberry will be cultivated for feeding silk worms; simply because those who feed the worms upon the mulberry leaves will not be enabled to compete with those who feed on Morus Multicaulis, and they will be either compelled to abandon the silk business or adopt the multicaulis for feeding. In relation to the hardiness of the Morus Multicaulis, I have cultivated it for seven years; never protected it in any manner whatever and never lost a tree by the cold of winter, or any other way. I had fifty young trees in my garden last winter, and not even a bud on the extremity of the branches was injured. It is true that about fifty yards west from where the young trees stood, there is a grove of oak trees, and on the north, fifty yards distant, my dwelling-house stood; and my garden has an exposure to the south, with a gentle declination. But my residence in the winter of 1831–2, was very different. It was on a farm, four miles in the country, in a northeast direction: the situation at an elevation of 3 to 400 feet above the tide water. There my Morus Multicaulis had an open exposure to the north-west wind; yet none were injured. During the whole time, I have had the white mulberry of various varieties, and have observed that they were all equally hardy—none more so, than the multicaulis. I have seen the young *unripened wood* of all varieties destroyed by the winter, and was very early led to adopt measures to guard against it, and now I never lose a bud.

None but the young trees are ever injured by winter, and all we have to do is to give them such a start as to enable them to ripen their wood previous to the approach of very cold weather. I raise all my trees from cuttings in a hot bed. About the first of March, I make an ordinary hot bed, like those used for cabbage plants; then I take the young wood of last year's growth, and cut it into pieces about two inches long, merely leaving a single bud on each; these I stick in the hot bed, three inches apart, in a slanting direction, the upper end inclining to the north, and burying it so that the bud is scarcely seen at the surface of the earth; sprinkle the bed with a watering pot, and put on the glasses; keep the bed properly moistened by watering every day, and throw matting over the glass at night, and in the middle of the day, to protect both from frost and the hot sun. By the middle of May, the plants will be four, six or eight inches high, and may then be transplanted to the place they are to grow, like cabbage plants, watering them once a day for eight or ten days, if the weather is dry; they will be found to be well rooted, and will grow from four to six feet the same season, and will ripen their wood so that the ensuing winter will not injure them. After the first year, I have never seen any of them lost by the winter, except in some extra cases, and in these the white mulberry has suffered, and even the native mulberry, fully as much as the multicaulis. Last winter, a white mulberry tree, seven or eight years old, in the western part of the city of Baltimore, was killed to the ground; while my Morus Multicaulis not a quarter of a mile from it, and north of it too, and in a higher situation, was not injured. Gideon B. Smith.

From the Genesee Farmer.

BEET SUGAR.

BY W. G.

There seems to be some little conflicting difference of opinion on the possibility of manufacturing beet sugar profitably by individuals or families, among those whose attention has been drawn to the subject, and who profess to speak from experiment. For instance, Mr. Sleigh of Philadelphia, in a late communication to the U. S. Gazette of that city, says: "An establishment will not clear its expense, unless it be calculated to manufacture at least from two to five hundred pounds of sugar a day; so that the idea of individuals in this country manufacturing profitably for private consumption is preposterous; their sugar would stand them, including labor, a dollar a pound." This opinion Mr. Sleigh says he has come to "after numerous experiments."

On the other hand, Mr. Le Ray de Chaumont, Mr. Isnard, and others intimately acquainted with the manufacture in France, assert that there can be no doubt of the practicability and profitableness of domestic or family manufacture, and that there are large quantities actually so manufactured in France. In addition to these statements, in "Journal des Debats," of April 15, 1836, appears an article on on this subject, in which it is stated, that four residents in the village of Wallers, department of the North, formed an association for making sugar, subscribing 50 francs each as cap tal. One was a blacksmith, the others farmers. These men were able to make from 40 to 50 lbs. a day, of sugar of a medium quality, a result surprising, considering their simple mode of conducting the process. They used curry combs to rasp the beet roots, used linen bags for expressing the juice, and the syrup thus obtained, was boiled in pots on the blacksmith's fires. Several others are mentioned as having introduced the business on a small scale successfully, and the French editor intimates as his opinion, that the time is not distant, when every family in that country, will make their own sugar, as they now do their preserves.

That some experience in the manufacture of beet sugar by companies and capitalists in this country must be acquired, before it can be introduced into families, can be readily conceived, but as the processes become simplified, and our farmers become familiarized with them, and with the culture of the beet, we can see no reason why it cannot be as well made in families here as in France; and there is no reason for doubt but that it will. If with cooking pots and a blacksmith's fire, six or seven dollars worth of sugar were produced; there can surely be no obstacles that American perseverance, and an improved apparatus will find insuperable.

☞ We have received a highly valued favor from the Hon. Abbott Lawrence, dated 15th inst, House of Representatives, Washington, relating to a parcel of *Seed Corn*, which has four or five ears on a stalk, &c. The package has not yet arrived, and we received the notices of the donation and the statements with which it was accompanied, too late for this paper. We have now only room to express our thanks to Mr. Lawrence for this repetition of his kindness and attention to the Agricultural interests of New-England. His letter and the documents with which it was accompanied, shall be published in our next.

[New-England Farmer.]

☞ A Premium of One Hundred Dollars, is offered for the best experiment made in the year 1837, in fattening various animals on apples—the premium to be awarded by a Committee of three Farmers, to be named hereafter in this Journal.

[Amer. Temp. Union.]

List of subscribers to the **Railroad Journal**, that have paid, (continued.)

Thos. Hassard, City, N. Y., Jan. 1, 1838
N. Bliss, " " " 1838
A. B. Taylor, " " " 1837
G. M. Wilkins, " " " 1838
W. H. Russell, " " " 1838
D. C. Colden, " " " 1838
S. Swartwout, " " " 1838
New-York, Boston and Providence Railroad Co., City, Jan. 1, 1838
A. Hovey, Binghampton, N. Y., " 1838
Railroad Office, Painted Post, " " 1838
New-Haven Atheneum, New-Haven, Con., Jan. 1, 1838
H. M. Walker, Philadelphia, Pa., Jan. 1, 1838
Lt. Bliss, York, Pa., " 1838
A. Pardee, Hazleton, Pa., " 1838
W. Kinney, Louisville, Ky., " 1838
R. H. Chinn, Jacksonville, Ill., " 1838
A. R. Johnson, Fort Levenworth, Mo. Jan. 1, 1838
Ross. Winans, Baltimore, Md., Jan. 1, 1837

Error in last No., Wm. Norris, Philadelphia, Pa., to Jan. 1, 1838, instead of Jan. 1, 1837.

Advertisements.

TO MANUFACTURERS OF HYDRAULIC CEMENT.

PROPOSALS will be received by the subscriber, on the part of the James River and Kanawha Companies, for the delivery on the wharf, at the city of Richmond, Va., of Fifty Thousand Bushels of Hydraulic Cement. The amount called for must be furnished in quantities of about six thousand, bushels per month, commencing on the first of April and ending on the first of November next.

To avoid future litigation, it is to be understood, on making the proposals, that the bushel shall weigh seventy pounds NETT, and that the Cement shall be delivered in good ordder, and packed in tight casks or barrels.

Proposals will also be received for furnishing fifty thousand bushels, at any convenient point on the navigable waters of James River, or the north branch of James River, where the materials for its manufacture has been discovered.

Persons familiar with the preparation of the Cement, would do well to examine the Counties of Rockbridge and Botetourt, with a view to the establishment of works for the supply of the western end of the line; and a contract for the above quantities will be made with them before they commence operations.

As there will be required on the line of the James River and Kanawha Improvement, in the course of the present and next year, not less than half a million of bushels of this Cement, and some hundred thousand bushels more in the progress of the work towards the west, contractors will find it to their interest to furnish the article on terms that lead to future engagements.

Proposals to be directed to the subscriber at Richmond, Va.

CHARLES ELLET, Jr,
Chief Engineer of the J. R. and Ka. Co.
February 20th, 1837. 9 6t

AN ELEGANT STEAM ENGINE AND BOILERS, FOR SALE.

THE Steam Engine and Boilers, belonging to the STEAMBOAT HELEN, and now in the Novelty yard, N. Y. Consisting of one Horizontal high pressure Engine, (but may be made to condense with little additional expense) 36 inches diameter, 10 feet stroke, with latest improved Piston Valves, and Metalic packing throughout.

Also, four Tubular Boilers, constructed on the English Locomotive plan, containing a fire surface of over 600 feet in each, or 2500 feet in all—will be sold cheap. All communications addressed (post paid) to the subscriber, will meet with due attention.

HENRY BURDEN.
Troy Iron Works, Nov. 15, 1836. 47—tf

ARCHIMEDES WORKS.

(100 North Moor street, N. Y.)
New-York, February 12th, 1836.

THE undersigned begs leave to inform the proprietors of Railroads that they are prepared to furnish all kinds of Machinery for Railroads, Locomotive Engines of any size, Car Wheels, such as are now in successful operation on the Camden and Amboy Railroad, none of which have failed—Castings of all kinds, Wheels, Axles, and Boxes, furnished at shortest notice.

H. R. DUNHAM & CO.
4—vtf

AMES' CELEBRATED SHOVELS, SPADES, &c.

300 dozens Ames' superior back-strap Shovels
150 do do do plain do
150 do do do cast steel Shovels & Spades
150 do do Gold-mining Shovels
100 do do plated Spades
50 do do socket Shovels and Spades.

Together with Pick Axes, Churn Drills, and Crow Bars (steel pointed,) manufactured from Salisbury refined iron—for sale by the manufacturing agents,

WITHERELL, AMES & CO.
No. 2 Liberty street, New-York.
BACKUS, AMES & CO.
No. 8 State street, Albany

N. B—Also furnished to order, Shapes of every description, made from Salsbury refined Iron v4—tf

A SPLENDID OPPORTUNITY TO MAKE A FORTUNE.

THE Subscriber having obtained Letters Patent, from the Government of France, granting him the exclusive privilege of manufacturing Horse Shoes, by his newly invented machines, now offers the same for sale on terms which cannot fail to make an independent fortune to any enterprising gentlemen wishing to embark in the same.

The machines are in constant operation at the Troy Iron and Nail Factory, and all that is necessary to satisfy the most incredulous, that it is the most VALUABLE PATENT, ever obtained, either in this or any other country, is to witness the operation which is open for inspection to all during working hours. All letters addressed to the subscriber (post paid) will receive due attention.

Troy Iron Works, HENRY BURDEN.

N. B. Horse Shoes of all sizes will be kept constantly for sale by the principal Iron and Hard-ware Merchants, in the United States, at a small advance above the price of Horse Shoe Iron in Bar. All persons selling the same, are AUTHORISED TO WARRANT EVERY SHOE, made from the BEST REFINED IRON, and any failing to render THE MOST PERFECT SATISFACTION, both as regards workmanship and quality of Iron, will be received back, and the price of the same refunded. H. BURDEN. 47—tf

NEW ARRANGEMENT.

ROPES FOR INCLINED PLANES OF RAILROADS.

WE the subscribers having formed a co-partnership under the style and firm of Folger & Coleman, for the manufacturing and selling of Ropes for inclined planes of railroads, and for other uses, offer to supply ropes for inclined planes, of any length required without splice, at short notice, the manufacturing of cordage, heretofore carried on by S. S. Durfee & Co., will be done by the new firm, the same superintendant and machinery are employed by the new firm that were employed by S. S. Durfee & Co. All orders will be promptly attended to, and ropes will be shipped to any port in the United States.

12th month, 12th, 1836. Hudson, Columbia County State of New-York.

ROBT. C. FOLGER,
33—tf. GEORGE COLEMAN,

ALBANY EAGLE AIR FURNACE AND MACHINE SHOP.

WILLIAM V. MANY manufactures to order, IRON CASTINGS for Gearing Mills and Factories of every description.

ALSO—Steam Engines and Railroad Castings o every description.

The collection of Patterns for Machinery, is not equalled in the United States. 9—1y

STEPHENSON,

Builder of a superior style of Passenge Cars for Railroads.

No. 264 Elizabeth street, near Bleecker street, New-York.

RAILROAD COMPANIES would do well to examine these Cars; a specimen of which may be seen on that part of the New-York and Harlaem Railroad now in operation. J25tf

PATENT RAILROAD, SHIP AND BOAT SPIKES.

*** The Troy Iron and Nail Factory keeps constantly for sale a very extensive assortment of Wrought Spikes and Nails, from 3 to 10 inches, manufactured by the subscriber's Patent Machinery, which after five years successful operation, and now almost universal use in the United States, (as well as England, where the subscriber obtained a patent,) are found superior to any ever offered in market.

Railroad Companies may be supplied with Spikes having countersink heads suitable to the holes in iron rails, to any amount and on short notice. Almost all the Railroads now in progress in the United States are fastened with Spikes made at the above named factory—for which purpose they are found invaluable, as their adhesion is more than double any common spikes made by the hammer.

*** All orders directed to the Agent, Troy, N. Y., will be punctually attended to.

HENRY BURDEN, Agent.
Troy, N. Y., July, 1831.

*** Spikes are kept for sale, at factory prices, by I. & J. Townsend, Albany, and the principal Iron Merchants in Albany and Troy; J. I. Brower, 222 Water street, New-York; A. M. Jones, Philadelphia; T. Janviers, Baltimore; Degrand & Smith, Boston.

P. S.—Railroad Companies would do well to forward their orders as early as practicable, as the subscriber is desirous of extending the manufacturing so as to keep pace with the daily increasing demand for his Spikes. (1J23am) H. BURDEN.

RAILWAY IRON, LOCOMOTIVES, &c.

THE subscribers offer the following articles for sale.

Railway Iron, flat bars, with countersunk holes and mitred joints,

						lbs.	
350 tons	2½	by	½,	15 ft in length, weighing		$4\frac{60}{100}$	per ft.
280 "	2	"	½,	"	"	$3\frac{50}{100}$	"
70 "	1¾	"	½,	"	"	2½	"
80 "	1½	"	½,	"	"	$1\frac{25}{100}$	"
90 "	1	"	½,	"	"	½	"

with Spikes and Splicing Plates adapted thereto. To be sold free of duty to State governments or incorporated companies.

Orders for Pennsylvania Boiler Iron executed.

Rail Road Car and Locomotive Engine Tires, wrought and turned or unturned, ready to be fitted on the wheels, viz. 30, 33, 36, 42, 44, 54, and 60 inches diameter.

E. V. Patent Chain Cable Bolts for Railway Car axles, in lengths of 12 feet 6 inches, to 13 feet 2¼, 2¾, 3¼, 3½, and 3¾ inches diameter.

Chains for Inclined Planes, short and stay links, manufactured from the E. V. Cable Bolts, and proved at the greatest strain.

India Rubber Rope for Inclined Planes, made from New Zealand flax.

Also Patent Hemp Cordage for Inclined Planes, and Canal Towing Lines.

Patent Felt for placing between the iron chair and stone block of Edge Railways.

Every description of Railway Iron, as well as Locomotive Engines, imported at the shortest notice, by the agency of one of our partners, who resides in England for this purpose.

Mr. Solomon W. Roberts, a highly respectable American Engineer, resides in England for the purpose of inspecting all Locomotives, Machinery, Railway Iron &c. ordered through us.

A. & G. RALSTON.
28 tf Philadelphia, No. 4, South Front st.

MACHINE WORKS OF ROGERS, KETCHUM AND GROSVENOR, Paterson, New-Jersey.

The undersigned receive orders for the following articles, manufactured by them, of the most superior description in every particular. Their works being extensive, and the number of hands employed being large, they are enabled to execute both large and small orders with promptness and despatch.

RAILROAD WORK.

Locomotive Steam-Engines and Tenders; Driving and other Locomotive Wheels, Axles, Springs and Flange Tires; Car Wheels of cast iron, from a variety of patterns, and Chills; Car Wheels of cast iron, with wrought Tires; Axles of best American refined iron; Springs; Boxes and Bolts for Cars.

COTTON WOOL AND FLAX MACHINERY,

Of all descriptions and of the most improved Patterns, Style, and Workmanship.

Mill Geering and Millwright work generally; Hydraulic and other Presses; Press Screws; Calenders; Lathes and Tools of all kinds; Iron and Brass Castings of all descriptions.

ROGERS, KETCHUM & GROSVENOR,
Patterson, New-Jersey, or 60 Wall street, N. Y.
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